

## On System With Cutout

Close cutout points or short the cutout terminals with pliers so as to connect battery to generator and observe ammeter discharge reading.

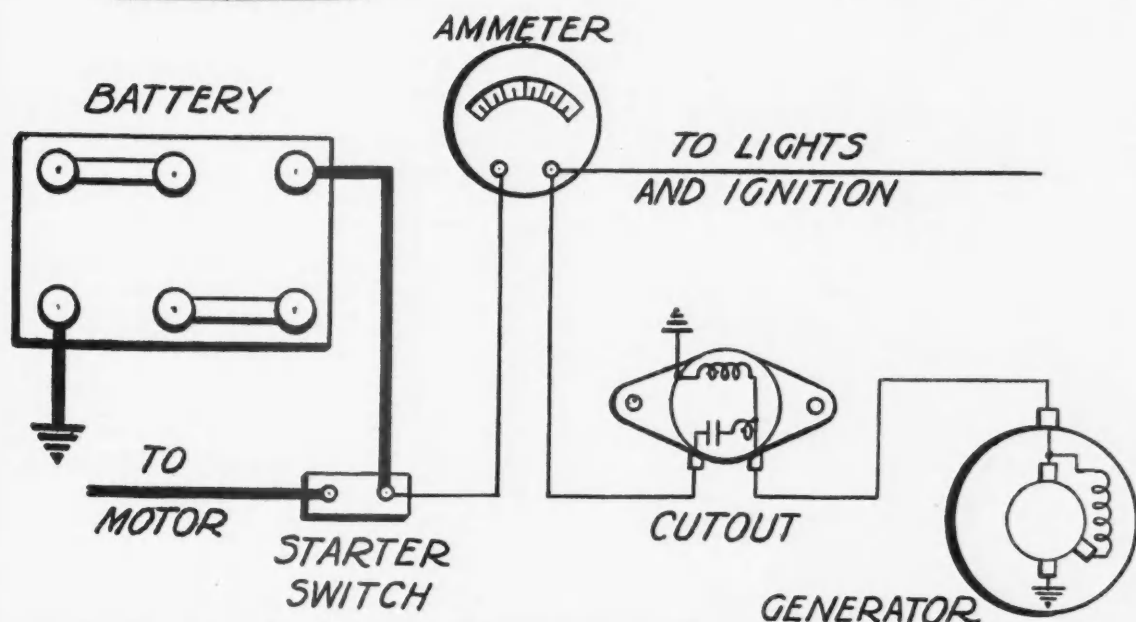
**No Current Indicated**

Open Circuit Between  
Battery and Generator

Locate with  
Wire test  
Lamp test  
or Voltmeter.

**Slight Discharge Current  
2 to 5 Amperes**

Field current only  
No armature current  
Brush stuck or  
armature open



Typical Generator Wiring Circuits on Car Where Cutout Is Used

**Discharge Unchanged**

Open field or stuck  
third brush  
Main brush grounded  
with weak battery  
(Would pull heavier  
current with good  
battery).  
Breakage in mechanical  
drive or armature shaft.

# Generator Fails

(Assumed That

ut

s with pliers  
ve ammeter

**Heavy Discharge**  
12 to 20 Amperes

**Normal**

Start engine and  
vary engine speed.

**Abnormally Heavy Discharge**

Throws ammeter needle off the scale.

Ground in generator.

With Delco system may be ground in wires  
from generator to ignition switch or  
ground in switch.

In system with cutout, may be ground in  
wire from generator to cutout or in cutout  
itself.

**Unchanged**

or stuck  
brush  
grounded  
battery  
all heavier  
with good  
ry).  
mechanical  
ature shaft.

**Ammeter Shows  
Normal Charge**

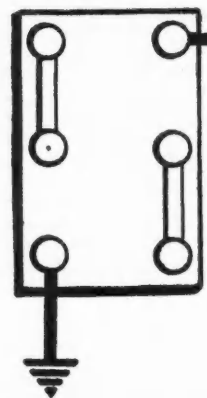
**Needle of Ammeter  
Comes up to Zero**

Armature  
shorted or  
grounded.

Oily brushes  
Slightly open  
armature  
Poorly-soldered  
field  
Cutout trouble.  
Try new one.  
Cutout not grounded.

AMMETER

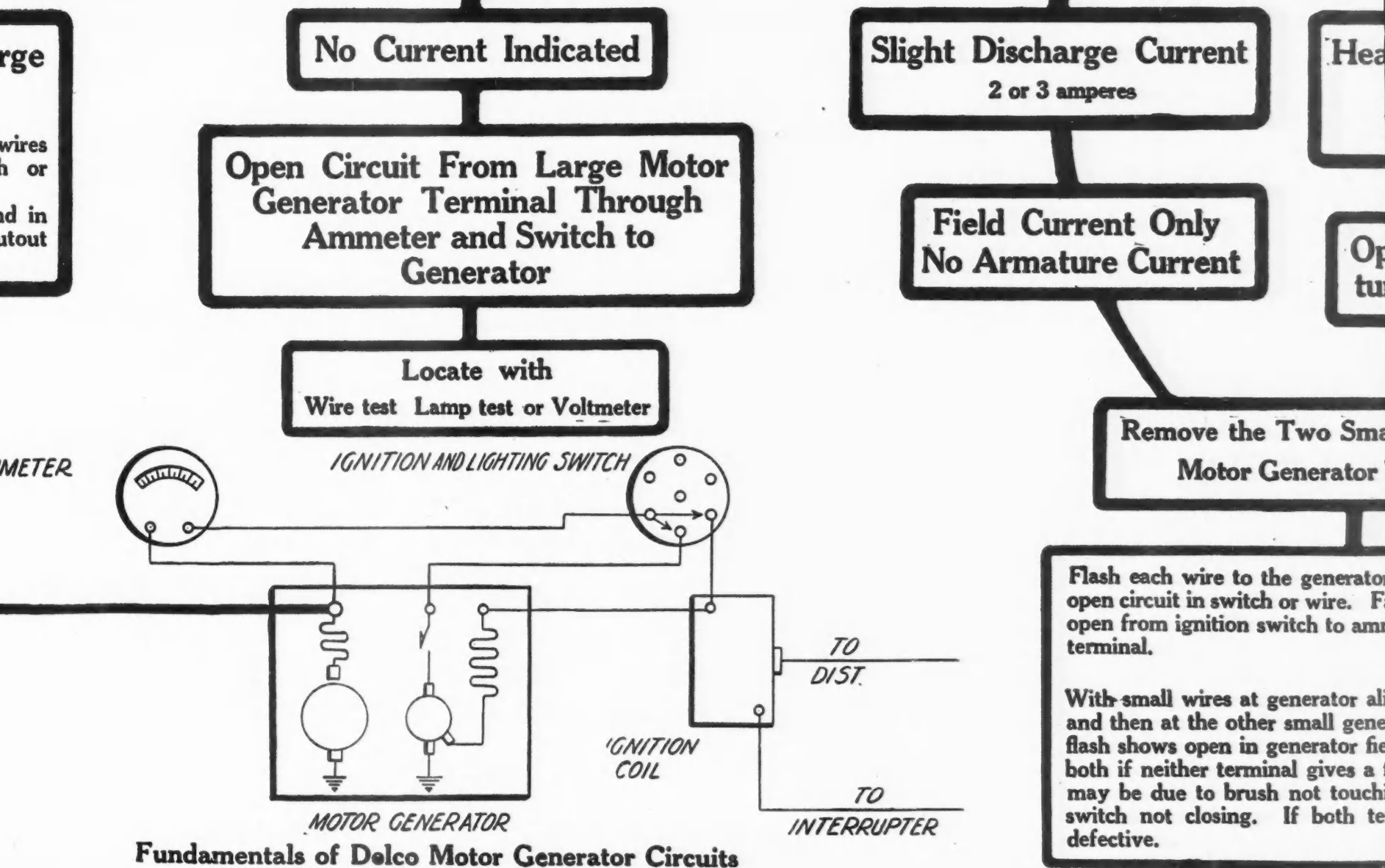
BATTERY



# ails to Charge Battery

(That Starter Is Operative)

**On Delco Mo**  
Separate Ignition C  
Ignition Switch and



**Fundamentals of Delco Motor Generator Circuits**

## On Delco Motor Generator Systems

Separate Ignition Contacts with Wood or Paper, Turn on Ignition Switch and Observe Ammeter Discharge Reading

**Slight Discharge Current**

2 or 3 amperes

**Heavy Discharge Current**

15 to 20 amperes.

Generator not motoring.

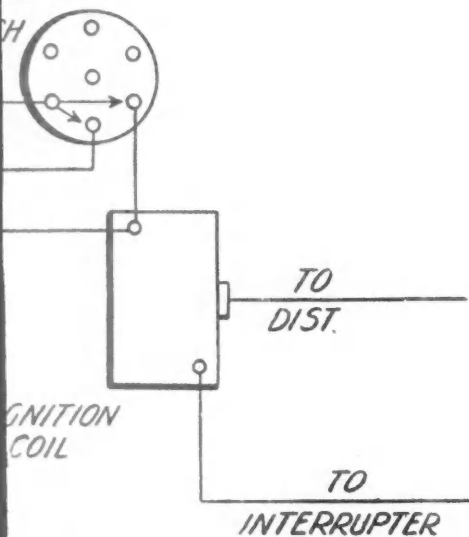
**Field Current Only  
No Armature Current**

**Open Field or Arma-  
ture Badly Shorted**

**Remove the Two Small Wires From  
Motor Generator Terminals**

Flash each wire to the generator frame. Failure to flash shows open circuit in switch or wire. Failure of both to give flash shows open from ignition switch to ammeter or ammeter to large motor terminal.

With small wires at generator alive, flash either wire first at one and then at the other small generator terminal. Failure to get a flash shows open in generator field circuit or armature circuit, or both if neither terminal gives a flash. Open in armature circuit may be due to brush not touching commutator or to generator switch not closing. If both terminals give flash, armature is defective.



or Circuits



**Fair Discharge Current**

5 to 7 amperes  
Generator motoring

**Normal**

**Clutch May Be Slipping So That  
Generator Is Not Being Driven  
When Engine Runs**

**Armature may be slightly  
shorted or open.**

**Brush holder may have  
intermittent ground.**



## The Well Equipped Shop Turns Out the Work

# Let Equipment Help You Meet the Peak of Summer Service

*Well Selected and Intelligently Used Shop Tools and Machinery Literally Make It Possible to Make Two Blades of Grass Grow Where Only One Grew Before. More Mechanics Not Always the Answer to Getting Work Out on Time. Cleanliness Big Factor in Speeding Up Service Work*

By B. M. IKERT

**S**HOP equipment is the one great life-saver which has helped many a dealer to successfully ride out over the peak of summer service.

Those who have made the flat rate system effective and efficient generally have found that shop equipment has played a major part in the work.

Unless a shop is properly tooled up, the flat rate system will not be entirely effective and service problems will not cease entirely by a mere adoption of a fixed price system for selling maintenance and repairs.

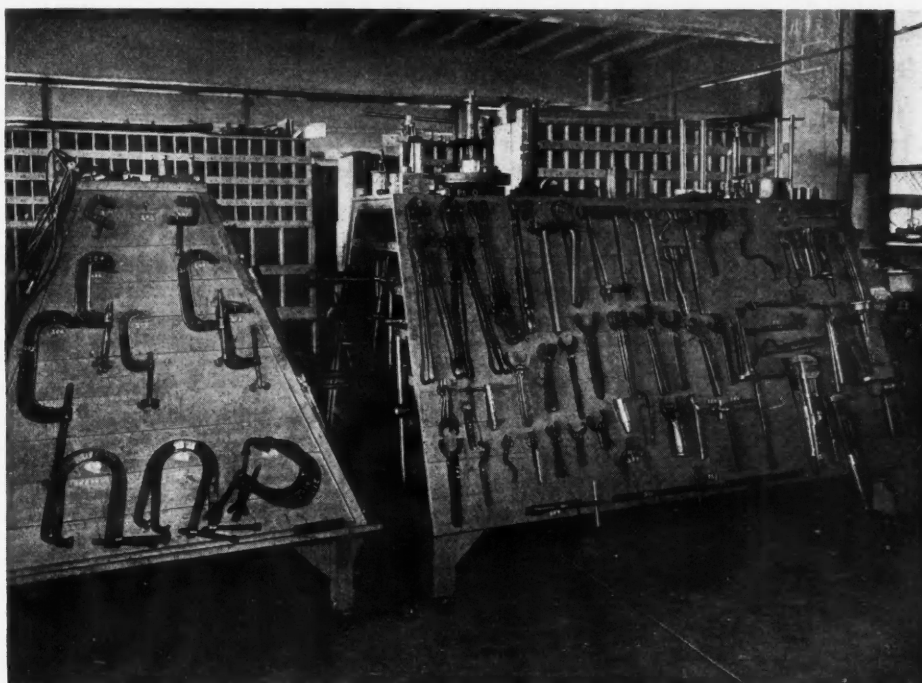
Almost always one will find that where a shop does not seem to be getting on successfully in meeting its flat rate time operations and prices is because of a variance in equipment compared to that of a dealer who has sufficient, and the right kind of equipment.

Having on hand a great amount of equipment is not always the answer, either. Recently the writer visited a shop that boasted of \$15,000 worth of machinery and tools and yet that very shop did not sell its service work (except cylinder grinding) at a flat rate. Drill presses, a lathe, shaper, milling machine and power driven hacksaw are fine pieces of equipment and very useful, but their mere presence in a shop does not mean that such a shop can successfully apply the flat rate system in selling its work.

A preponderance of machine tools is not a substitute for the smaller hand tools and special devices which speed up the work and which is necessary when working on all makes of cars, as has to be done by the dealer in the smaller communities if his shop is to be self-sustaining.

Summer service for the dealer or service station in the smaller towns means an onrush of business that is entirely different in character from the work taken into the service departments of dealers in metropolitan areas.

The small town service station and general repair shop draws its work from car owners, truck owners, farmers who own tractors and stationary gasoline en-



*In order to make it easy to get at tools quickly they might be placed on racks, as shown. This makes it possible to quickly spot the tool needed for any particular operation*

gines, and in many localities from motor boat owners who neglected last fall to put their boat engines in shape for the next summer.

Therefore, while the big service station catering to one make of car only in the large city can choose a highly specialized line of equipment to comply with its needs, the smaller town service station which must service more than one make of car and also take in much of the above mentioned diversified forms of service, has to tool up with equipment that meets a universal need.

For example, every shop, big or little, does a great amount of work on valves and almost every kind of valve tool or machine which can be used to do this work better and more quickly than hand methods will prove a profitable investment. These valve tools take in such things as the electrically driven outfits

by means of which the face can be trued up; the hand driven valve lathes which are intended for the same purpose; the valve reseating tools; valve stem guide reamers; electric valve grinders, lifters, etc.

The time saved by using the right tool for the job is manifested in the following: A shop put in a valve facing and reseating tool which made possible doing a job of valve regrinding in 66 minutes which otherwise took exactly 424 minutes. The reason we can quote exact figures on this is because time study sheets were kept for both jobs. The results as given by these sheets are printed in connection with this article.

It is apparent that the shop which grinds in valves by the old hand method and requires 424 minutes on a six-cylinder engine, is going to have a vastly different flat rate for the job than the

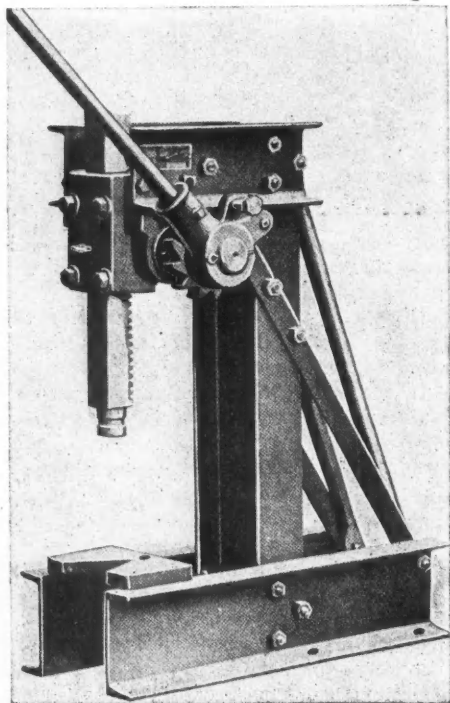


shop which has the tools and equipment to do the same work in 66 minutes, to say nothing about speeding up the work and making it possible for the shop to do more work in a given time.

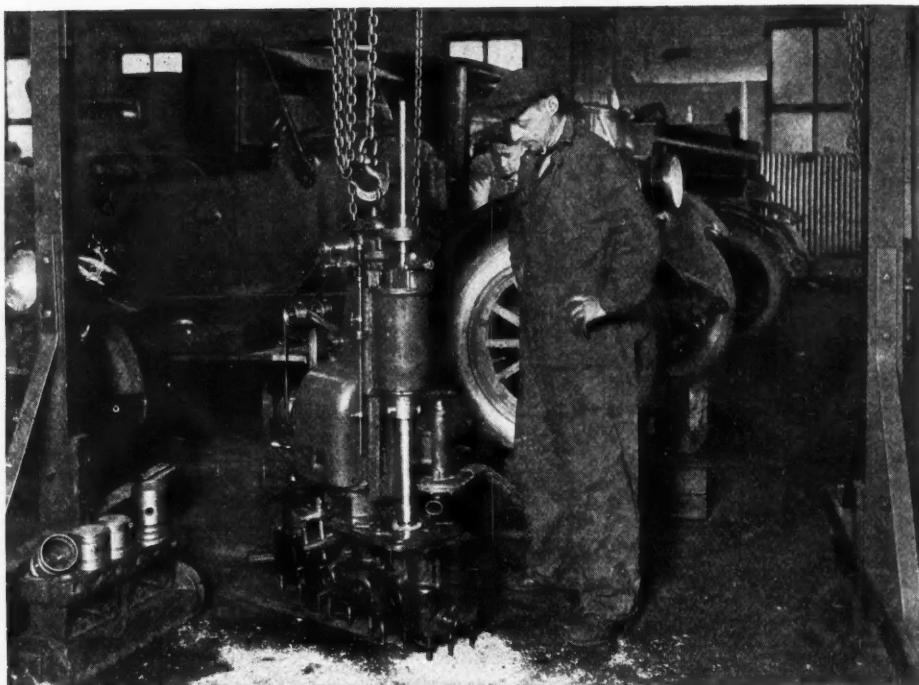
In order not to give the wrong impression it should be stated that the time schedules shown in the accompanying sheets for the valve grinding jobs exclude all dissembling and reassembling of the cylinder head, removal of the valve springs, etc., and are intended to show the actual grinding time only.

It will be noted that in Chart A most of the valves in this particular engine needed only a touching up and are, therefore, charged with only a few minutes' time. However, number 9 valve required 36 minutes; number 12, 58 minutes, and number 7, 274 minutes before it seated properly. Thus one valve required more time than all the other eleven. The man in charge of the shop said that if the valve seat for this valve had been properly cut down with a reseating tool to a 45 degree angle a very few minutes' grinding would have given the valve a perfect seat.

The great saving in time on an operation performed with the proper tool or machine over-hand methods is illustrated vividly in Chart B. It happened that none of the valves in this engine was what one would call in good shape when the engine was taken down. They were badly pitted and the one designated as number 12 was badly warped and in most cases would have been relegated to the junk pile. An inspection of the two valve grinding jobs showed also that after all had been said and done the job done with the aid of the valve facing and



A type of press which rapidly is replacing the old hammer and drift manner of removing or inserting a bushing. Arbor presses are used for such a variety of work that they are an indispensable piece of equipment to every shop.



This mechanic has just started a cylinder grinding machine and presently will go on some other job, leaving the grinder at work. Here again, equipment makes it possible for the men to do more work within a given time

## Chart A

Here are listed the time schedules of a valve regrinding job on a six-cylinder engine of the valve-in-head type. The time does not include taking off the head, removing the valves, etc., but is given only for the actual time of grinding the valves.

	Time Finished	Minutes
1. Began 10:29 A. M. 8/20/23.		
2. Grind No. 1 Valve.....	10:24	5:00
3. Grind No. 2 Valve.....	10:28	4:00
4. Grind No. 3 Valve.....	10:32	4:00
5. Grind No. 4 Valve.....	10:37	5:00
6. Grind No. 5 Valve.....	11:02	25:00
7. Grind No. 6 Valve.....	11:06	4:00
8. Scrape carbon .....	11:14	8:00
9. Personal delay .....	11:26	12:00
10. Scrape carbon .....	11:30	4:00
11. Grind No. 7 Valve (not finished).....	12:00	30:00
12. Resume work on this job. P. M.....	1:00	
13. Grind No. 7 Valve (Valve won't seat).....	1:29	29:00
14. Get requisitions for and secure new Valve, from stock room.....	1:40	11:00
15. Grind No. 7 Valve (new).....	2:23	43:00
16. Looking for finer compound.....	2:30	7:00
17. Grind No. 7 Valve.....	2:47	17:00
18. Conference with foreman about No. 7. Foreman files valve down. (2 men) .....	2:55	16:00
19. Grind No. 7 Valve.....	3:10	15:00
20. Other work (decided on return to let No. 7 go as it is for a while and come back to it after the others were done).....	4:09	
21. Grind No. 8 Valve.....	4:12	3:00
22. Grind No. 9 Valve.....	4:48	36:00
23. Grind No. 10 Valve .....	4:51	3:00
24. Grind No. 11 Valve.....	4:54	3:00
25. Returned to work after supper.....	6:00	
26. Grind No. 12 Valve.....	6:58	58:00
27. Finish grinding No. 7 Valve.....	9:02	124:00

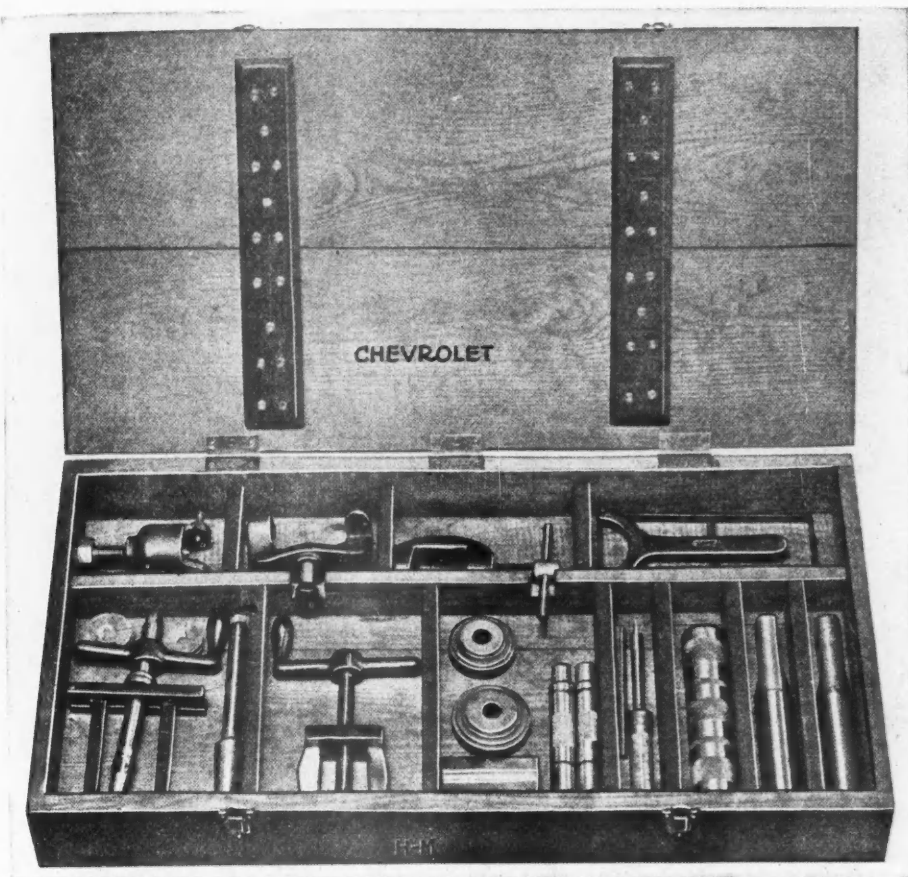
Total time 466:00

## SUMMARY

Grinding Valves .....	424:00
Scrape carbon .....	12:00
Personal delays .....	12:00
Stock chasing .....	11:00
Tool time .....	7:00

Total time 466:00





Many of the equipment manufacturers are furnishing special cabinets of tools designed to facilitate service on a particular make of car. The above tools are for Chevrolet and take in such items as a brake cam lever remover, steering wheel puller, plain arm bushing remover, connecting rod aligner, piston inserter, etc.

### Chart B

This collection of time schedules was taken on the same kind of engine as in Chart A. The valves were in worse shape, however. A valve refacing and reseating tool was used on this job and the results in the saving of time are evident by a comparison to the times given in Chart A.

	Time Finished	Minutes
1. Began 1:22 P. M. 8/22/23.		
2. Scrape carbon off head block and valves.....	1:43	21:00
3. Face Valve No. 1 on machine.....	1:47	4:00
4. Face Valve No. 2 on machine.....	1:50	3:00
5. Face Valve No. 3 on machine.....	1:52	2:00
6. Face Valve No. 4 on machine.....	1:55	3:00
7. Face Valve No. 5 on machine.....	1:59	4:00
8. Face Valve No. 6 on machine.....	2:02	3:00
9. Personal delay .....	2:04	2:00
10. Face Valve No. 7 on machine.....	2:06	2:00
11. Face Valve No. 8 on machine.....	2:07	1:00
12. Face Valve No. 9 on machine.....	2:09	2:00
13. Face Valve No. 10 on machine.....	2:11	2:00
14. Face Valve No. 11 on machine.....	2:12	1:00
15. Face Valve No. 12 on machine.....	2:18	6:00
(Valve No. 12 was very badly warped.)		
16. Cut down seats with reseating tool.....	2:22	4:00
17. Apply compound to faces of valves and plane valves in head.....	2:25	3:00
18. Grind valves in head with screw driver twirled between hands.....	2:34	9:00
19. Squirt thin oil around valves and give them finish polish.....	2:37	3:00
20. Remove all valves, clean up valves and head with cloth and gasoline; apply blue to valves.....	2:47	10:00
21. Test fit of valves to seats, all are O. K.....	2:51	4:00

Total time 89:00

#### SUMMARY

Valve grinding .....	66:00
Scrape carbon .....	21:00
Personal delays .....	2:00

Total time 89:00

reseating machine was by far the better.

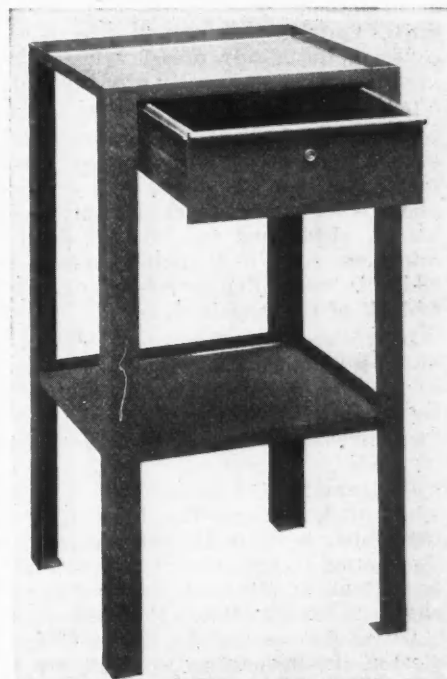
What applies to the saving in time on valve operations applies equally well to other jobs. Take the matter of bushings.

A much better and quicker job is done by forcing out a worn bushing in an arbor press, or if the unit cannot be brought to a press, by using one of the portable tools called bushing extractors, than is done by driving it out with a hammer and drift. Likewise a better job results in inserting a new bushing by means of a press than can possibly result by hammering in a bushing. Besides all this it creates a better shop morale to use tools and equipment which eliminate the hammer and crowbar, the two items to which cartoonists always point with pride when "taking off" the garage mechanic.

One of the clutch and transmission makers recently stated that they had experienced so much trouble in service from mechanics attempting to pull a clutch by means of crowbars that a special clutch puller had been designed and will be placed on the market soon. The idea is not to sell the puller at a profit, but rather to instill into the minds of mechanics that the right tool must be used for the job in question.

Not having the right tool means running a risk of damaging the units involved. That is why it always pays to have on hand a variety of wheel pullers, gear pullers, special spanners and other apparatus which make a job easy to perform and with absolute safety.

The profit which ought to result from a job easily might be taken away if the mechanic breaks or damages the units in question and much of the work has to be done a second time.



In order to conserve the mechanic's time, a tool stand, as shown above, makes a handy piece of shop furniture. It keeps parts and tools off the floor and in general, speeds up the work

Very often you see two or three men struggling with a job that easily could be handled by one man if the right kind of equipment was available. It is common to see two or three men take out an engine with a common block and tackle suspended from a rafter. One man with a crane can handle the job and inasmuch as most such cranes are portable the engine, axle, or whatever the unit might be can be carried to any spot desired, usually to a stand in the shop.

The market today affords a variety of engine stands which make it possible for the mechanics to do better work and do it more quickly and with less fatigue. An engine stand makes it unnecessary for a mechanic to ask another "for a hand" every now and then. The engine can be swung in any direction and dismantled or reassembled with no confusion or loss of time.

A mechanic lying under a car taking up the bearings ought to be the exception these days but you still see a lot of it and one of the best ways in which to get more work out of a given time is to provide some means whereby the car can be elevated from the floor enough so that a mechanic can work at the bearings with comfort and dispatch. A crane hoist or other piece of similar equipment which can be bought will answer the problem.

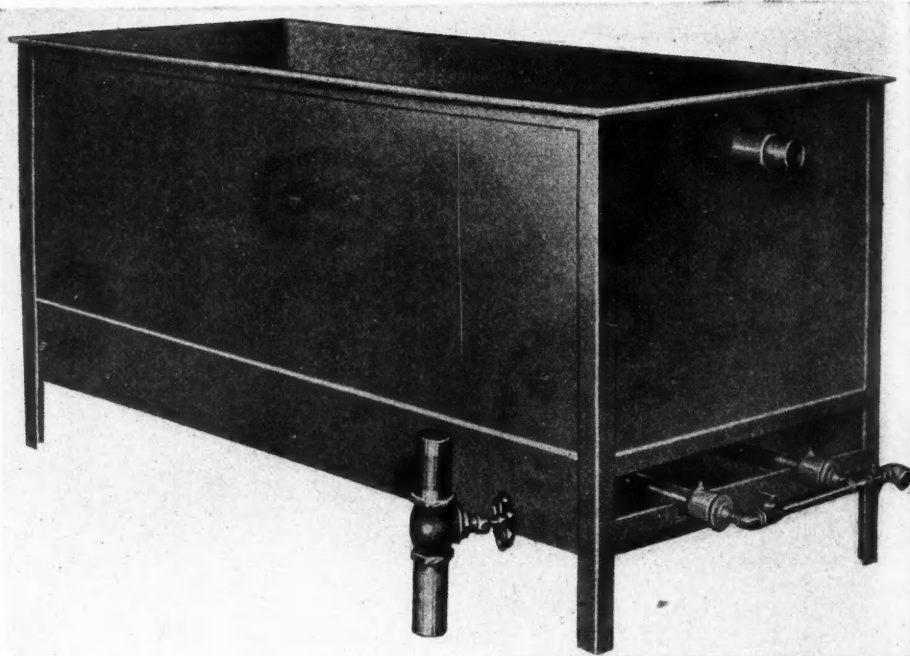
One of the indispensable pieces of equipment is an arbor press. A vast amount of work in connection with automotive vehicle maintenance is of such a nature that a press of some kind is an absolute necessity. The removal and installation of bushings is one of the chief uses of a press. Forcing gears from shafts, straightening shafts and so on are typical examples of the work done on an arbor press. It replaces the hammer and drift. Parts are not damaged by it because of the steady pressure it applies in contrast to a succession of violent and often misdirected hammer blows.

Among the tools and apparatus which come under the classification of precision tools, the shop should have a surface plate, micrometers, dial indicator, V-blocks, piston and rod aligning device, thickness gage and similar apparatus which is more often associated with the tool kit of the machinist.

Instruments of the kind mentioned above save much time on a job and insure better results. The mode of procedure on a job often is designated by the instrument or apparatus used in testing.

For example, let us say a car comes with clutch trouble. To all appearances the clutch is at fault, but the fact of the matter is that the clutch may not be at fault at all. But how is the mechanic to know? Here's the answer:

Let us assume the shop has a dial indicator, the instrument we shall use to make the diagnosis. Suppose the engine in question is of the unit-powerplant type, having a bell housing on the transmission and clutch assembly. The transmission bell housing usually is fitted with a pilot which fits into the bore of



*If it is a question of saving the mechanic's time, a cleaning tank for washing engines, axles, etc., before they are worked upon is a most needed piece of apparatus. Clean parts are easier to work upon and, furthermore, the grease and dirt is not spread all over the shop to slow up things.*



*The group of tools shown here is used on many makes of cars. A collection such as this while it represents quite an investment is very much worth while for the service station which is called upon to service many makes of automobiles. In the main the tools consist of wrenches and spanners*



the flywheel housing. Maybe this bore is concentric and maybe not. Also the bore may be too large or too small for the pilot on the transmission housing. If it is too large the result is that the transmission bell housing although held on by cap screws will sag sooner or later, especially if there is much wear in the clutch shaft pilot bearing or its seat in the flywheel.

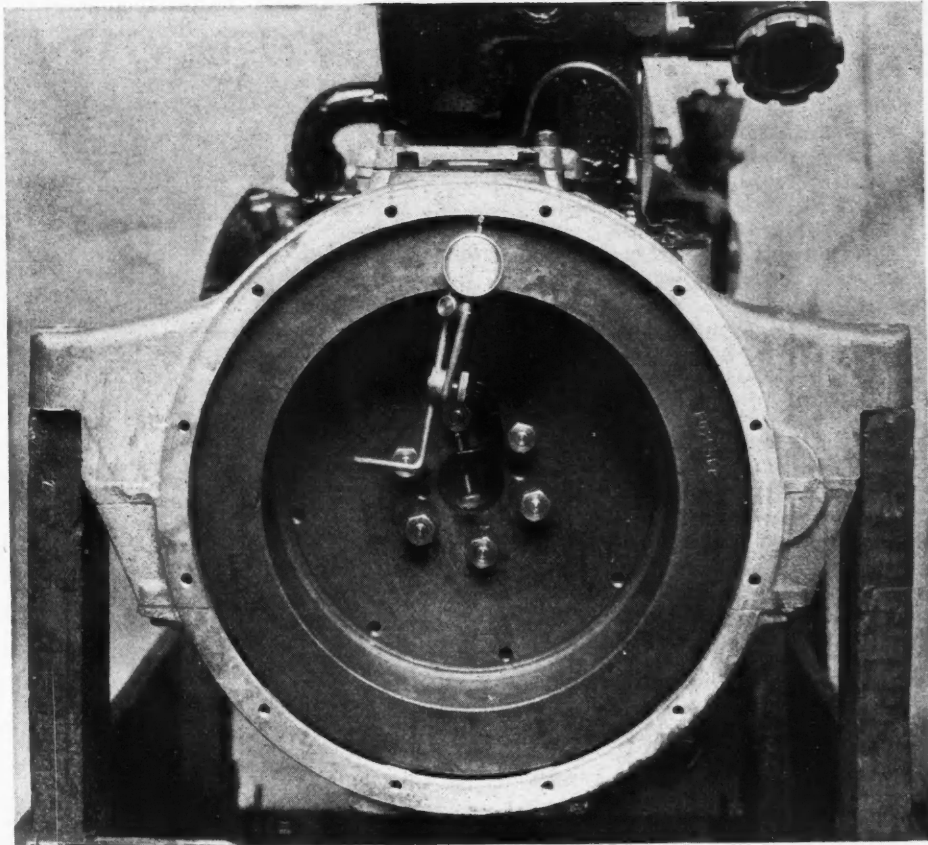
Now, by fastening the dial indicator support to the flywheel in the manner shown in one of the illustrations, it is possible to test the bore of the flywheel housing and note the variation from true circularity. Therefore, the mechanic immediately has a check as to the cause of the trouble and the remedy will suggest itself. In that way much valuable time is saved, not only in making the proper diagnosis, but in applying the correct remedy.

The best mechanic in the world can't tell if a connecting rod is bent or twisted, unless it is so far gone that even an untrained eye can spot it. There must be means for accurately telling if a rod or piston will run true in the cylinder. And the only thing that will do this is a connecting rod aligning jig. Some shops have made their own jigs and have done a good job of it, but we believe in the long run the shop is better off by buying one of the jigs which the market affords.

A surface plate and V-blocks used in connection with a dial indicator is the finest thing in the world for testing the straightness of a crankshaft, camshaft or any similar piece of equipment which must be dead true to a few thousandths of an inch in order to function correctly. It takes but a few minutes to make these tests and they are time-savers of the most important kind. They are to the mechanic what the X-ray is to the dentist in ascertaining what has to be done and then observing if it has been done correctly.

Get as big a collection of wrenches as you possibly can lay your hands upon.

They are the most used tools in the shop and no matter how many you have now there always will come a job into



*Getting the most out of equipment does not always necessarily mean that major operations are to be performed with machine tools. Very often the use of precision tools and instruments simplifies an operation. For example, in the above illustration is shown a method of using the dial indicator on the bore of the flywheel housing. This operation is imperative in fitting up the bell housing on the clutch in order to secure perfect alignment*

the shop that takes a special wrench you haven't got. If the Runwell car takes a double-jointed wrench of a certain kind to adjust the clutch, the best plan is to get friendly with the Runwell dealer or some jobber and buy one of the wrenches to have on hand so that the next time a Runwell car comes in with a slipping clutch everything will be "jake." I know of one shop which prides itself on the collection of special tools it has to fit about a dozen different makes of cars.

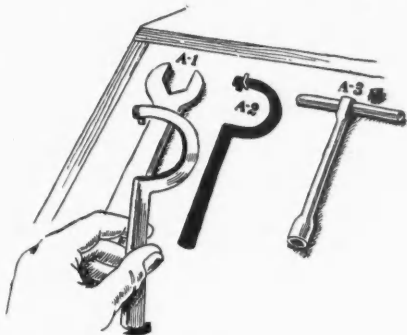
The same shop, by the way, has about \$1500 in reamers alone. Every time a car came in for a job which required a certain size or type of reamer to do the job right, a man went out and bought the reamer if the shop was not already provided with one. In this way the collection has grown and would be the envy of all mechanics and shop foremen if they could see it.

We must not overlook the fact that it is not only the shop equipment which saves time and makes it possible to get more work out of a certain number of men without crowding them. There is such a thing as having on hand plenty of funnels, oil cans, drop lights, pieces of emery cloth and sand paper cut into small squares of convenient size, tool stands for the men to rest parts and tools upon, drip pans to put under cars,

compressed air and gas connections at the bench.

One of the surest ways not to speed up work and get the most out of your equipment is to have a dirty shop and a cluttered up bench. The present rush of work in most shops makes it doubly imperative that everything possible be done to keep the shop tidy. A bench will at times become pretty well loaded with tools, parts, etc., but that is no excuse for allowing all this stuff to remain there and eventually make the bench top a storage place for junk. There must be room to do a job decently.

A good plan to follow is that adopted by one shop. There is a rule in this shop that every man must clean up his bench every night before he leaves. The tools are put into their respective places and the top of the bench, which is covered with zinc, is neatly wiped off. A man who takes care of the place at night sweeps the floor and in morning when the mechanics come on duty the whole shop presents a good appearance and there is an incentive for the men to keep things looking neat and doing much better all-around work. One very outstanding fact in getting the most out of the men and equipment is to make the surroundings pleasant. When things are pleasant everybody is happy and happy mechanics certainly will work tooth and nail for the dealer.



*A lost or misplaced tool often means many valuable minutes on the part of the mechanic looking for it. In order to get a check on the tools it is a good plan to paint the outline of the tool on the tool rack, as shown. The outline immediately denotes the character of the tool and an additional check is furnished by the number or symbol above the tool*

# Profits That Grow by the Roadside

*Efficient First Aid and Towing Service  
Often Results in More Shop Work, In-  
creased Accessory Sales and a Friend  
for Life*

By A. H. PACKER

Decrepit appearance though strong inside,  
It'll do to give the wrecks a ride.

An ancient touring with ragged top  
To bring cars into the greasy shop.

A good appearance? That's high brow stuff.  
We've got one sign up, and that's enough.

What? Go when we're busy? Well I declare,  
He'd probably be gone when we got there.

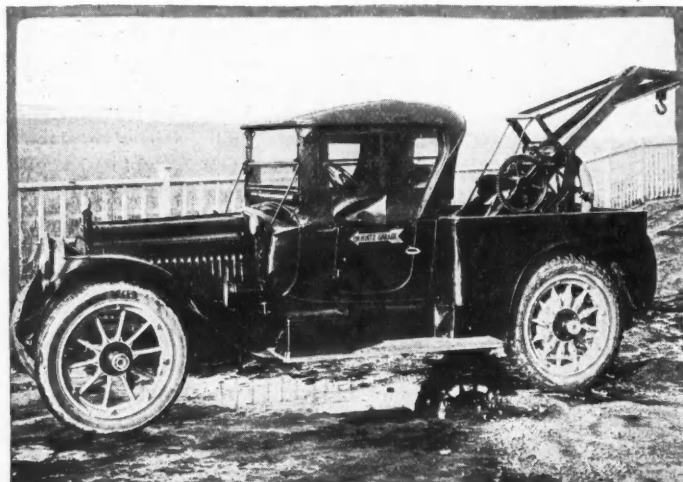
Good will? My eye. We're loaded now!  
What? Think of the future, and sales, Oh,  
wow!

But a mile away, where the road bends so,  
Is another shop that I think you know.

And their tow car's a beauty, and useful, too,  
And always ready to go to you.

Like the fire department, it's ready to go  
Through the summer's heat or the winter's  
snow.

And when summer's gone, that shop stays filled  
On the friendship the tow car has helped to  
build.



**N**O COLLAR, a greasy vest, tobacco juice spilled down his shirt, a hat that has seen better days, pants that have not felt an iron since the previous owner had them. What kind of fellow inside?

A window with a new tire, an old one, some dead flies, a timer that refuses to time, some worn out pistons, an add for top dressing, streaks on the window from last Hallowe'en, odds and ends of junk, new mixed with old, no place for anything, and everything in it. What kind of shop inside?

Did you ever see a man like that and a shop like that? They always seem to fit, the man and his clothes and the shop and its window.

And the service call to a shop like that meets what sort of response.

"Stuck, you say, 'stoo bad, Jim's out now, tell him when he comes in. No, I can't come, no one to take care of the shop." And so it goes, the service, the shop, the owner and the window are all alike, and the tow car, if one is on hand for intermittent service when Jim happens to be there, is probably a fitting match for the rest of the outfit.

The shop like that will do some business, it will make some money, but if you talk to the man who runs it you will probably find that he has a choice string of dead beats working him, for the man who intends to pay a fair price for what he gets, also wants to make sure that he gets it, and one of the things that will bring him is the sight of a good looking wreck car, as it goes here and there along the roads. Good windows and good work all help, but the wreck car is a necessary part of any repair shop equipment, so why throw away the advertising that it can do at the same time that it is bringing jobs to your shop?

## Direct Results From the Tow Car

It was a substantial brick building, once a livery stable, but now an automobile repair shop, and while the general appear-



ance wasn't much, still the window was rather attractive, so I went in. Inside the details were not in harmony with the ancient appearance of the building for there was a modern show case with accessories attractively displayed, while the modern nature of the methods was extended even to radio, a loud speaker announcing the latest news developments, even as I entered. The place was in a foreign quarter of town but on one of the much traveled highways leading out of town, so I did not expect much of its proprietor.

I asked him if he did much towing business and he answered, "Yas, ve do quite a bid, samtimes ve be oud all day, samtimes not for two, drie days."

"Make any money at it," I wanted to know.

"Yas, boud a tousan dollars las' year, made drie tousan de year pefor, bud dat was best year on dowing. I'll see jas vat da figures come to."

And the shop man who did not appear to have enough intelligence to even keep books of any sort, went to the vault and pulled out a well-kept book and put his finger right on the figure he wanted, the gross receipts from the use of his tow car, some \$987.50, if I remember it correctly.

And he added, "Den id prings de shob vork dat ve voodent get if ve didn use da car."

And as I went away I thought of a number of high toned men who would do well to copy this one's methods, use a good wreck car and keep records with sufficient accuracy so that the results could be determined at the end of the year.

### Extending Your Shop Service With the Wreck Car

The men who man the tow car should be competent mechanics for they may often by the use of some initiative be able to render service on the spot, so that the car owner may be on his way again in the least possible time. Such men in coming in contact with the public will not only have to analyze the mechanical trouble, but will find it necessary to estimate a proper charge for the job. A coil may be needed, perhaps a timer or a piece of wire, and in any case a charge of some kind must be made for the labor and material. General prices can be given to the men who do this work, but instructions cannot be given which will cover every emergency. There will, therefore, be some mistakes. Perhaps too much or too little will be collected, but this should not be an occasion for

"balling out" the man on the job. Rather should the right procedure be explained to him, and if he is the right sort of man he will take it in the spirit in which it is meant, and may develop into a service salesman or contact man.

The good mechanic is required on the truck for another reason also, for it is just as important to know when the car really should come to the shop as it is to know when a trip to the shop is not needed. Replacing a coil, or timer, a wire, or filling the gas tank can be accomplished on the road as well as at the shop, but mechanical breakage requires time and equipment, neither of which are available on the road.

A wreck may be a catastrophe, but the bright side is the side the shop foreman sees, the various jobs that must be done to put the car in shape again, and a good wreck car probably brings to the shop as much or more in indirect profits as it does in direct returns on charges for work done with the car.

### Working for the Motor Clubs

This ability of the wreck car to bring good jobs to the shop is best utilized when the garage is affiliated with a good motor club, in which the members have arrangements for getting towing service wherever they may be stuck, for not only does a goodly check come in each month to cover the work done for the members, but where a car is stuck, there is not much chance of the owner being able to take it elsewhere even if he wanted to.

### Sales Possibilities

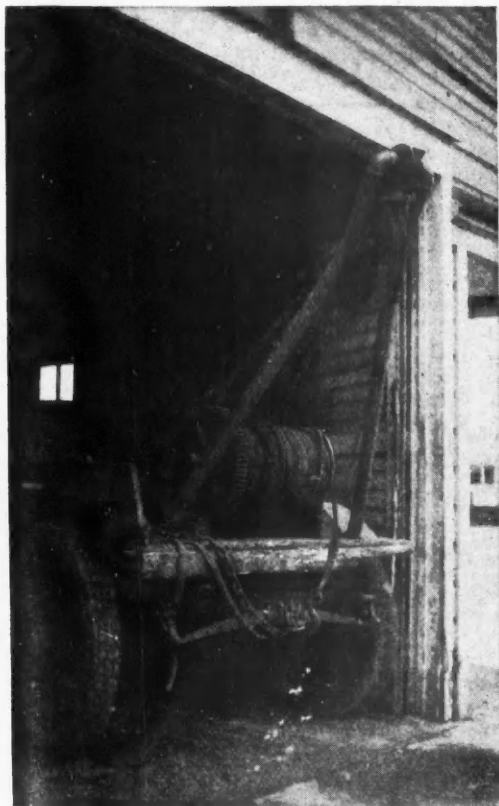
When a man is stuck because he neglected to fill the gas tank at the last jump, he is probably saying to himself, "Why didn't I ever get one of those cans for carrying a spare supply of gas." That is the time to sell him one.

Of course you cannot carry the whole accessory case along on each road job, but if you know what the man is up against, he may be easy to sell on some one item. Suppose, for example, he has gone off the road in a rainstorm partly because he had no chains and partly because he had no windshield wiper and could not see the bend in the road. There is certainly a chance to cash in on his state of thought in a case like that.

Perhaps if he had had a tow line, he would not have had to wait for your car; that means a chance to sell a good line, for with it a passing motorist could have given him a lift.

If a case of tire trouble is the occasion for the trip the possibilities are obvious. A casing may be needed, or perhaps a tube, a blowout patch, tube repair material or even a pump or jack, and a selected list of items of this sort would be a good line to have right in the car. Then special items might be carried, depending on the kind of a car that happened to be in distress.

So the wide-awake maintenance man will use his wreck car to render service, to make friends, to make profits, to bring in work and to increase sales.



Left—the appearance of this car might be improved some, but it is right on the job when it comes to bringing 'em in  
Above—a car that picks up from \$1000 to \$3000 a year on the roads that lead south from Chicago

# Profitable Equipment for Dispensing Oil and Gas

Quality, Honest Measurement and Rapidity of Service, Factors to Be Considered

By EDWARD D. JONES

A QUART of oil," called the car owner as he pulled into a certain large garage which shall be nameless. "Make it Blank A." "All right, comin' up," responded the garage-keeper, who thereupon proceeded to draw the desired quantity from a barrel in the rear of his establishment well out of view of his customer.

This process was repeated three or four times for other customers, and, regardless of whether the brand wanted was Blank A, Teapot Dome Special, or what not, it all came out of the same barrel, each customer being greeted with the same "comin' up" and the same brand of oil.

This was a bit curious, to say the least, and so this resourceful garage-keeper was asked whether all the different grades of oil he handled were kept in the same barrel, and if so, why it was material what grade was specified by the customer.

"Certainly," he replied; "what difference does it make? It's all the same oil, a good grade, and I use it in my own car. What these birds don't know won't hurt 'em."

## Car Owners Expect Real Value for Their Money

He was then asked whether he supplied all of his storage customers with gasoline and was unable to say. He thought that perhaps there was quite a proportion of them who bought their gasoline elsewhere. No doubt the same was true also of their oil, for the automotive merchant who thinks that he can dispense oil from a barrel instead of using the modern equipment now on the market which enables the purchaser to see the amount and the quality of the product he is buying need only consult his books to learn that, instead of fooling the public, he is in reality fooling only himself. Motorists are fast becoming "wise" and expect full value for every dollar spent. The same holds true of gasoline equipment. When the car owner is convinced that he is getting a product that is not going to damage his engine, and that he is also getting the amount he is paying for, he is in a better frame of mind and is likely to think of this particular automotive establishment in connection with his future gas and oil needs and fill up before starting on a trip rather than take a chance on being fairly treated by someone on the road with whom he is not acquainted.

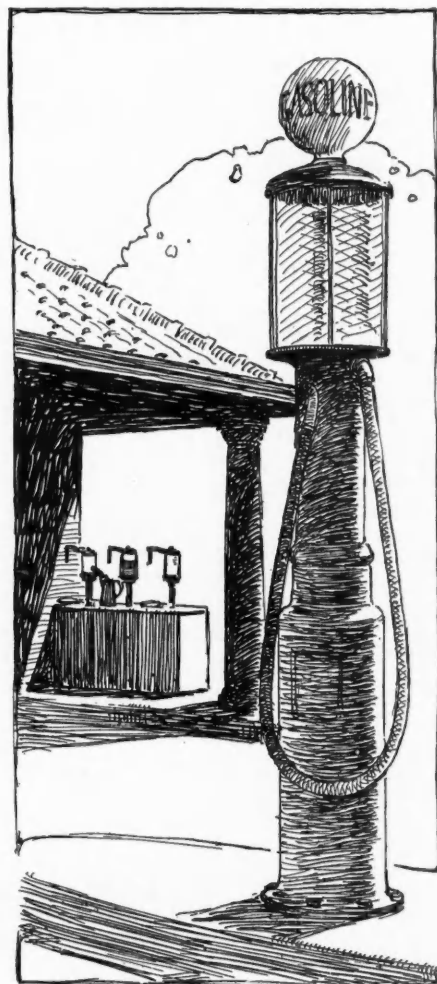
With 15,286,295 cars and trucks registered in the United States at the end of 1923, and production going steadily forward, the tremendous possibilities existing for the profitable sale of gasoline and oil are at once apparent. And certainly a business of such gigantic proportions calls for efficient handling through the use of modern equipment, scientifically designed and skillfully produced to do a specific job with ease and economy; equipment that functions efficiently and has the ability to handle trade rapidly; equipment that is of attractive appearance and likely to catch the eye of the passing motorist and hence draw trade to the automotive establishment; equipment that obviates the possibility of wastage or leakage and thus insures to the purchaser full measure.

These are important things for the proprietor of the automotive transportation store to consider, and the extent to which he does consider them will determine his share of this enormous business. The man who sells new cars and who conducts a service station certainly is rendering a service to his customers in supplying them with honest fuel with which to operate their cars. The subject of high grade fuel is one that is receiving increased attention nowadays, and it is not unusual to find people who are strongly advocating laws requiring dispensers of gasoline, for example, to post on their pumps specifications of the product they are selling, so that the buyer can tell exactly what grade of fuel he is going to feed to his car.

Pump makers in designing their equipment likewise have had this matter of gas efficiency in mind and have produced equipment which they claim does not agitate the gas, but delivers the most volatile blends without evaporation losses, and they likewise have provided for purification of the gasoline by means of screens and filters. Certainly no one will deny that by the use of visible equipment the car owner at least can see the kind of gas he is getting, and also can form a pretty good idea as to whether he is getting the amount he orders.

## Buyer Can See He Is Getting Full Measure

Some pumps are equipped with devices which indicate to the buyer the exact amount he is receiving; on others a bell announces completion of each gallon measurement of the piston stroke; another expedient made use of is a sight



glass in the discharge arm, showing the level of gas and assuring the customer that the pump is full when pumping begins. Then the stroke of the piston forces the discharge of an exact measure. The measurement is accomplished with mechanical precision. During the discharge the customer sees through the sight glass that all the gas enters the hose leading to his car. Positive stops control each gallon measurement, thus eliminating the possibility of human error. The wire glass used in the sight discharge is constructed to stand more than 100 pounds pressure. The actual size of the opening through which the gasoline is visible is 3 inches.

Another factor, in addition to accuracy, which must be kept in mind by the automotive merchant is the rapidity with which customers can be served. Every-



body is in a hurry these days and service delays do not tend to sweeten one's disposition, and in the busy service station the quickest possible service must be provided. One manufacturer has made provision for this in the following manner: By a single movement of the electric valve the power pump fills the glass measuring cylinder very rapidly; a simple movement of the discharge valve and the gas flows quickly into the automobile tank. It is claimed by the manufacturer that this particular type of equipment will supply gas to one customer a minute. Another feature claimed is that one pump will supply several service posts.

### Oil Pump Gives Quick Service

In the case of one oil pump, claimed by its maker to be "the speediest hand-operated dispensing pump on the market," it fills as it empties, and one quart is always in the cylinder on display, ready to be sold to the next customer. It is contended that by one turn of the crank there is secured an accurate quart in 5 seconds' time.

One maker of a gasoline pump reports the average handling time of 5 gallons as 15 seconds, the discharge being secured merely by the operator touching a throttle. Another manufacturer claims a speedy container which is filled in 24 seconds and drained in 36 seconds; that but 16 revolutions of the handle are required to pump 5 gallons—13½ turns on up stroke and 2½ on the down stroke.

### "Quick Return" Arrangements Feature of Equipment

The "quick return" arrangement is declared to be such that the piston rod, when raised to its full height, is returned to its original position with a few quick turns of the handle, one revolution on the return being equal to 5½ turns of the handle on the up stroke. The mechanism is automatic and is operated by the backward movement of the handle.

In cases where it is found necessary to dispense large quantities of gas in the shortest possible time, one type of equipment that is in use in the electrically-operated pump, and it also is capable of hand operation.

Still another maker claims for his apparatus a normal rated capacity of 22½ gallons per minute.

One solution of the problem of saving time has been advanced by one of the large manufacturers who makes a combination 10-gallon dispenser of gasoline and two visible quart cylinders for oils, designed to conserve space and investment. It is air operated.

Durability and attractiveness of appearance also are points that should not be lost sight of in the purchase of gas and oil dispensing equipment. In one device weather-proof housing protects all the working parts. Protection against weather is especially a feature to be considered in connection with oil pumps in order to prevent contamination of the oil. In the case of one manufacturer all

## Seasonal Oil Changes



This map, prepared by the manufacturers of Sun oils, shows by diagram the approximate time change grades of oil to meet season conditions. The boundaries on this map were made to conform to average reports issued by the United States Weather Bureau. Unseasonal and exceptional weather conditions may make slight variations advisable.

tank openings are turned up ½ inch, which permits fill cover and pump base to fit down over the half-inch projection, making a water-tight tank. The nozzle is so constructed that it prevents the entrance of water into the drip tube. Tanks also are constructed so as to be proof against theft and leakage.

Appearance of the equipment also is a vital factor in securing business. A pump of distinctive character which easily catches the eye of the passing motorist is much more apt to keep the cash register ringing than is one of just ordinary appearance. Here is a chance to carry out the transportation store idea of the automotive dealer or service establishment; for surely nothing is more essential to automotive transportation than are gas and oil.

### Distinctiveness of Appearance Is Important

Efficient service in this respect is sure to be appreciated, just as is efficient service in any other line of business—and, incidentally, it will put dollars into the pocket of the man who renders it. In the transportation field, as in any other, quality is of paramount importance, and is just as essential as the service element. Seeing is believing; and the customer who sees what he is getting has more confidence in the oil he puts into his engine and the gas he puts into his tank than the customer who gets his oil out of a barrel along with all the other customers.

Another point to be taken into consideration in the promotion of gasoline and oil sales is the effect it will have on the sale of accessories. When a man drives up for five gallons of gas, it is an easy matter to start talking accessories to him. If these can be displayed in such

a manner as to get his attention, the matter of selling him is all the easier. If all you sell cannot be displayed to advantage in the vicinity of the pump, induce the customer to enter your establishment and then "sell" him on the idea that he needs the things you are in a position to supply him with.

In the early days of man's existence things were done entirely by hand; gradually machines were invented to take the place of manual labor and to lift some of the burdens that man had been carrying for centuries. As civilization advanced there grew with it an increasing realization of the need for the most up-to-date machines and the most modern methods of doing things; and this is an idea which has become firmly entrenched in our economic structure.

In the automotive industry the need for specialized tools for the performance of certain operations in the shop and in the servicing of cars is constantly being stressed as promoting the efficiency of the automotive establishment, and necessarily, the prosperity of its owner. What is true of the shop is, of course, true of every other branch of the business, and certainly that branch of the business which has to do with the dispensing of gas and oil.

So, Mr. Transportation Merchant, if you are not already "sold" on the value of the most modern, and the most efficient, in equipment for this purpose, think it over and ask yourself whether you are really getting your share of this enormous gas and oil business; whether you are doing your part in helping to keep running the more than fifteen millions of cars and trucks now using the nation's highways; whether your bank balance is what it ought to be, considering the possibilities for business that exist in your community.

May 15, 1924

## Gypsy Highway

By CARL MOST





## Among Leading Figures at Detroit Next Week



From left to right: F. A. Bonham, chairman of Service Committee of N. A. C. C., and of committee in charge of Automotive Maintenance Equipment Show and service convention. M. L. Hemingway, general manager Motor & Accessory Manufacturers Association, and member advisory committee assisting General Manager Miles. H. R. Cobleigh, secretary of service, N. A. C. C. S. A. Miles, general manager of maintenance equipment show. Coker F. Clarkson, general manager of S. A. E. and member of program committee for service convention. H. M. Crane, president of S. A. E., on program of service convention.

# First Maintenance Equipment Show

## Automotive Service Convention

### N. A. D. A. Calls Conference of Trade Association Secretaries and Managers.

THE first National exhibition devoted exclusively to automotive maintenance equipment will be held in Detroit next week.

This show has been arranged by the National Automobile Chamber of Commerce, in cooperation with allied trade organizations, and will be held in conjunction with the annual automotive service convention of that body. The show will be held at the General Motors building and opens on Monday and closes on Friday.

Opening on Wednesday and continuing through Saturday will be the World Motor Transport Congress, also sponsored by the N. A. C. C., an undertaking to bring the automotive leadership of the United States strikingly to the attention of the transportation interests of the whole world. Delegates from many nations are expected to attend this meeting.

Another event of the week will be the second annual conference of automobile trade association secretaries and managers under the auspices of the National Automobile Dealers' Association. This meeting will be held on Tuesday at Hotel Statler.

Joined with the N. A. C. C. in promotion of the Automotive Maintenance Equipment Show are the Society of Automotive Engineers, Motor & Accessory Manufacturers Association, National Automobile Dealers Association, Automotive Equipment Association and Service Equipment Associates.

For a number of years the Service Committee of the N. A. C. C. has held annual service conventions which were

primarily for the service managers of the automobile manufacturers. This year the Service Committee decided to enlarge the scope of the convention and prepare a program for the benefit of distributors, dealers, service station proprietors, garage men and the trade in general, as well as for the factory representatives. The Service Committee of the N. A. C. C. having this in charge is composed of Frank A. Bonham, Durant, chairman; A. B. Cumner, Autocar; L. C. Voyles, Marmon; W. M. Warner, Cadillac; F. J. Wells, Pierce-Arrow, and H. R. Cobleigh, N. A. C. C. secretary.

The program for the service convention was arranged by a committee consisting of Mr. Bonham representing the N. A. C. C., Coker F. Clarkson of the Society of Automotive Engineers, and C. A. Vane of the N. A. D. A.

### World Motor Transport Congress Also Attracts Eyes of All Nations to Detroit.

The maintenance equipment show will be open only to the automotive trade, including the delegates to the service convention and the World Motor Transport Congress. It will not be open to the general public. Anyone interested in the business of automotive maintenance will be welcomed at the show and tickets of admission will be issued to them upon application to the National Automobile Chamber of Commerce. An invitation has been extended to all dealers.

The show is under the management of S. A. Miles, veteran manager of national automobile shows for the N. A. C. C., who has assisting him a committee composed of M. L. Hemingway, general manager of the Motor & Accessory Manufacturers Association; William M. Webster, commissioner of the Automotive Equipment Association; S. Duncan Black of the Service Equipment Associates, and H. R. Cobleigh, secretary of service of the N. A. C. C.

An important feature of the show will be the fact that maintenance equipment that is used with power will be shown in operation so that those who view it will get an accurate idea of what the machines can do under actual working conditions.

Exhibit space has been allotted to about 100 makers of tools and service equipment, some of whom will announce distinctly new articles. Some of the exhibitors have prepared very elaborate displays showing a wide variety of product and many uses.

In the pages that follow will be found as complete a description of the prod-

### PROGRAM OF N. A. D. A. SECRETARIES' CONFERENCE

Tuesday, May 20, 1924

- 9:30 A. M.—Call to order. C. A. Vane, Gen. Mgr., N. A. D. A.
- 9:30 — "The Employment Bureau." Charleton C. Proctor, Mgr. Buffalo Automobile Dealers' Assn.
- 10:15—Discussion.
- 10:30—"The News Letter; An Aid to Selling," Harry T. Gardner, Mgr., Cincinnati Automobile Dealers' Assn.
- 11:30—Discussion. Luncheon.
- 1:30 P. M.—"The Traffic Bureau." T. D. Braden, Mgr., Denver Automobile Dealers' Assn.
- 2:15—Discussion.
- 2:30—"Association Savings and Loan." Claude E. Holgate, Mgr., Newark Automotive Trade Assn.
- 3:15—Discussion.
- 3:30—"General Activities of Trade Assn." Herbert Buckman, Mgr., Cleveland Automobile Dealers' Assn.
- 4:15—Adjournment.

## Program of Service Convention and Equipment Show at Detroit

### MONDAY, MAY 19

MORNING 10:30 A. M. to 2:00 P. M.  
Registration

Purpose of the Meeting

By F. A. Bonham, Chairman

1. "What the Public Is Entitled to Receive from Service Men."

By C. A. Vane, General Manager, National Automobile Dealers Association.

2. "Selection and Training of Repairmen."

By J. C. Wright, Director, Federal Board for Vocational Education.

3. "Shop Layout and Selection of Proper Tools."

By E. M. Young, Advisory Staff, General Motors Corp.

EVENING 6:00 P. M. to 10:00 P. M.  
Opening of Maintenance Equipment Show

### TUESDAY, MAY 20

MORNING 9:00 A. M. to 2:00 P. M.  
Maintenance Equipment Show

AFTERNOON 2:00 P. M.

4. "How to Properly Fit Pistons and Bearings."

Illustrated.

By D. Andrews, Service Manager, Continental Motors Corporation.

5. "Proper Adjustment of Rear Axle, Gears and Bearings."

By Col. H. W. Alden, Past President, Society of Automotive Engineers, and Chairman of the Board, Timken-Detroit Axle Co.

6. "Adjustment of Brakes."

By F. C. Stanley, Ph. D., Chief Chemist and Service Engineer, The Raybestos Co.

EVENING 6:00 P. M. to 10:30 P. M.  
Maintenance Equipment Show

### WEDNESDAY, MAY 21

MORNING 9:00 A. M. to 2:00 P. M.  
Maintenance Equipment Show

AFTERNOON 2:00 P. M.

7. "How the Service Man Can Co-operate With the Engineer."

By H. M. Crane, President, Society of Automotive Engineers; Technical Assistant to President, General Motors Corp.

8. "The Effect of Heating Alloy Steel Parts—The Proper Way to Repair"

By L. A. Danse, Chief Metallurgist, Cadillac Motor Car Co.

9. "The Effect of Poor Lubrication."

Illustrated.

By Dr. W. K. Lewis, Head of Department of Chemical Engineering, Massachusetts Institute of Technology, and Chemical Consultant, Standard Oil Co.

EVENING 6:00 P. M. to 10:00 P. M.  
Maintenance Equipment Show

### THURSDAY, MAY 22

MORNING 9:00 A. M. to 2:00 P. M.  
Maintenance Equipment Show

AFTERNOON 2:00 P. M.

10. "Selling Service."

Illustrated.

By Carl H. Page, Director of Sales, Durant Motors of New Jersey.

11. "Simple Accounting System."

Illustrated.

By Wm. G. Eiben, Vice-President, Comfort Printing Specialty Co.

12. "The Electrical System Explained."

Illustrated.

By Warren K. Lee, North East Electric Co.

EVENING 6:00 P. M. to 10:00 P. M.  
Maintenance Equipment Show

ucts on exhibition as it was possible to obtain in advance.

The growing importance of mainten-

ance in the automotive industry lends widespread interest to this service convention and exhibition and leaders of the

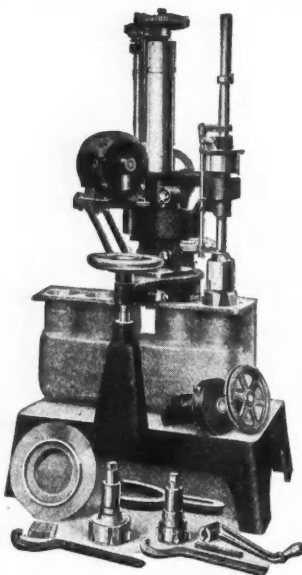
industry are hopeful that it will be sufficiently successful to warrant continuance as an annual affair.

## Maintenance Equipment Assembled at Detroit

MOTOR AGE presents herewith brief descriptions of as many of the exhibits of the Automotive Maintenance Equipment Show as it was possible to get in advance. In the limited space available it was not possible to describe all the items to be exhibited by the various exhibitors, but an effort has been made to illustrate and describe the new and interesting articles. The show will be fully covered by MOTOR AGE editors and will be reported fully in a subsequent issue.

### For Cylinder and Bearing Reconditioning

Tools for the rebabbiting of main bearings whenever engines are overhauled will be exhibited by the Storm



Model M Stormizing machine

Manufacturing Co. of Minneapolis. Storm main bearing tools for this purpose are made in two sizes, one for Ford engines

and one for Fordsons. These devices not only provide alignment and facilities for pouring the babbitt, but also include a boring bar which is equipped with cutters for finishing all three bearings at the same time.

The Storm exhibit will also contain a model M machine for refinishing cylinders, this machine being suitable where the engine has been dismantled and the cylinder block can be handled separately. For use on the car a portable machine known as model S will be shown, this device making it possible to both bore the cylinders and also give them a fine finish without dismantling the engine.

### Painting and Oiling With Air

It is sometimes said that this is a high pressure age. This is certainly true of modern service stations and air under pressure comes in for its share of consideration when power is needed. The air compressors that will be displayed by the Brunner Manufacturing Co. are not new, for the line is fairly well standardized. The application of air pressure, however, to the cleaning of parts, the oiling of springs and the painting of chassis any body is an activity which deserves attention from progressive shop

executives. The Brunner paint sprayer and cleaner holds about a quart of liquid, either paint, cleaning fluid or oil. The container is so designed that the upper portion is of small enough diameter to be grasped with one hand, while a convenient trigger controls the flow of spray.



Brunner paint sprayer and cleaner

A variety of air compressors which make possible the use of devices such as the paint sprayer and also render service to the customer, will be on display at the show.



### Shop Equipment That Protects the Car



Kent-Moore Special tap and die set for Chevrolet

Appreciating that any job needs suitable equipment for protecting the car as well as repairing it, the Kent-Moore organization has developed a line of seat covers, steering wheel covers, and fenders covers which make it possible to turn out a clean job as well as a good one. The complete set includes also door covers and cowl covers and sells for \$14. The Kent-Moore line of shop equipment is very extensive, including tools for doing practically any job on a Chevrolet car. A special electrical test stand for Chevrolet generators and starting motors is also available.

It is one thing to get the proper tools into the shop and it is sometimes another thing to get the mechanics to use them properly. Realizing this fact the Kent-Moore organization has prepared charts, one of which shows the steps to be taken in reconditioning a connecting rod, another shows the steps to be taken in overhauling an engine, while the third describes the various electrical tests. These charts are intended to be posted on the wall of the shop where the mechanics may study them.

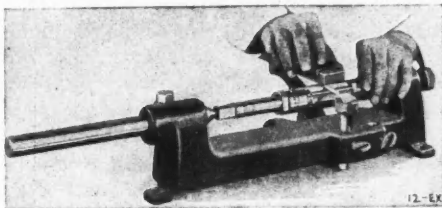
### A Reamer Sharpener

Dull reamers have lost at least one maintenance shop a good customer. A well known car was taken into the shop to have new pistons installed and after it had run less than 1,000 miles a very pronounced knock developed. On having the engine taken down it was found that wrist pin bushings were badly loosened, due primarily to the fact that a dull reamer had been used which had gouged away large portions of the bearing surface so that the balance of the bearing rapidly wore down. To obviate just such possibilities the Foster-Johnson Reamer Co. of Elkhart, Ind., has brought out a reamer sharpener which will be exhibited. With this device dull reamers either of the solid or adjustable type can be sharpened to cut as keen as when new.

The reamer is held on two adjustable dead centers while a tooth resting on the back side of the machine holds the reamer blades in the correct position for sharpening. On the front of the machine is an adjustable support for the hone carrier. By raising or lowering this support the holder is adjusted to conform to the correct cutting angle of the reamer blade and by easy strokes back and forth the hone is used and in a

few minutes the blade is put in condition again.

This device will handle reamers up to  $2\frac{1}{2}$  inches in diameter, the centers being adjustable to take reamers varying in length from four inches to  $12\frac{3}{4}$  inches in length. The size of the hone is  $\frac{5}{8}$ -inch by  $1\frac{1}{2}$ -inch by  $4\frac{1}{2}$ -inch and the whole device sells for \$30.



Foster Johnson reamer sharpener

### Wrenches of Alloy Steel

Chrome vanadium steel has been used in wrenches made by the Bonney Tool and Forge Co., of Allentown, Pa., these being available for a variety of purposes. A line of single end assembler's wrenches made with handles 6 in., 9 in. and 12 in. long is especially recommended for fine work, such as tappet adjustment. For a V-type motor where room is limited the 6 in. type is recommended. The angle of opening of these is  $22\frac{1}{2}$  degrees.

Another line of single and straight opening wrenches with openings from 1 in. to  $2\frac{1}{4}$  in., all with  $12\frac{1}{4}$  in. handles, is intended for work on pinion shaft adjusting nuts and driving mechanism. Another line of wrenches is intended for use on water pump packing nuts, the angle of opening being 30 degrees. These are made very thin and have short handles running from 7 in. to  $8\frac{1}{2}$  in. in length. The thickness of the heads runs from  $\frac{1}{8}$  in. to  $\frac{1}{4}$  in. and the milled openings from  $\frac{1}{8}$  in. to  $2\frac{1}{4}$  in. The three new lines of wrenches will be on display at the show.

The Hinckley-Myers Co. of Jackson, Mich., will have on display a full line of



Bonney tappet wrench, drive shaft wrench and water pump wrench

### Shop Tools to Save Time and Temper



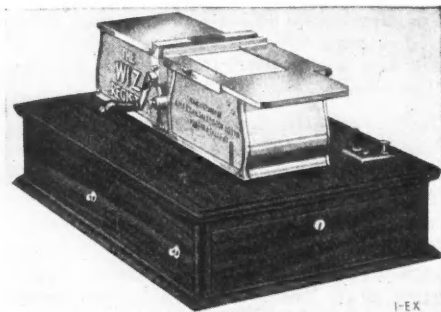
Hinckley-Myers bushing drivers and arbor press tools for the Ford shop  
Hinckley-Myers Ford transmission bushing reaming machine

shop equipment, both universal and specialized. In the case of special equipment for Ford service, for example, this concern has a transmission bushing reaming machine which is so constructed that it is practically impossible to have imperfect alignment. The transmission triple gears are secured in the centering device by the use of a special fixture which centers in the same manner as the transmission drum. The machine may be bolted to a work bench in a horizontal position for hand operation or in a vertical position when used in connection with a drill press. The many devices sold by this company are almost too numerous to mention, including items ranging from radiator plugs to cylinder reboring mills. It is not always the largest items, however, which are most appreciated by the good mechanic. Any man who has worked on an arbor press has probably hunted around the shop, in the junk box and under the bench for a piece of brass or steel which would suit his purpose in driving out a bushing. To meet this need the Hinckley-Myers Co. has a set of bushing drivers and arbor press tools which save a great deal of time and make the removal of bushings a simple and easy operation. This set for Ford work contains drivers for the front wheel spindle arm bushing, for the front wheel bearing raise, for the reverse drum, for the driven gear, for the slow speed drum bushing, for the spindle body bushing, for the axle gear and drive shaft bearing sleeve and for the stationary cone.

### Sales Record Books for the Shop

The fact that many automotive establishments have suffered losses in business due to inaccurate records of transactions has emphasized the need of good office equipment as well as good shop equipment. In many cases disputes arise at the end of the month over items charged, where the customer demands proof that he really received the goods, but the proprietor does not have a definite proof to offer. Sales record slips as provided by the American Sales Book Co., of Elmira, N. Y., provide against such occurrences, for they make it easy to write an accurate record of every transaction, and have the customer place his initials on the slip. Comparatively recent modifications of the sales book idea are known as the Sure Trip and

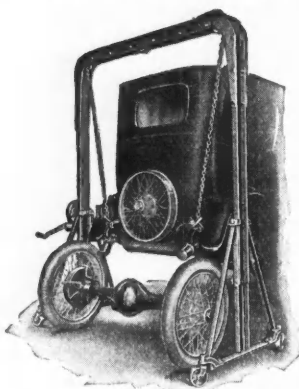
Sure Quad books. With these, a slip is torn out after the customer has signed, and this slip is given to him. The other two slips remain intact and are kept as a credit record until the end of the month. Then they are separated and one forms a portion of his itemized statement while the other remains as the shop record. For use at the sales counter the WIZ Flat Packet Register is offered. In this register flat packets of interfolded slips are used instead of rolls, so that the machine can be quickly loaded.



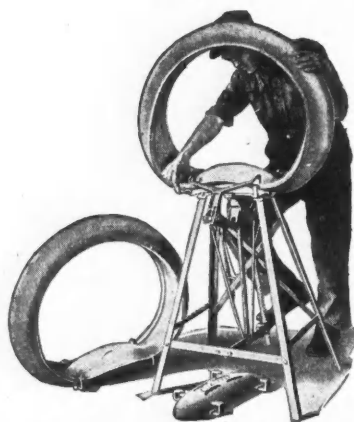
*The WIZ cash drawer and register combination*

#### Tire Equipment for Sales and Service

Among the many items of garage equipment to be displayed by the Weaver Manufacturing Co., there will be a tire spreader which makes it convenient to inspect any point on the inside of a casing. Rollers are provided in the device for quickly turning the tire and when in any position the foot lever may be operated to spread the casing so that



*Equipment of this sort saves time in the shop*



*A tire spreader makes satisfied customers and produces sales*

any part may be plainly seen. This same machine makes it an easy matter to attach a buffing plate which holds the casing in such a shape that the interior may be buffed.

The equipment for tire shops is but a small portion of the Weaver line, for they have a large variety of equipment for quickly and easily handling cars in the shop and on the road. The show exhibit will include jacks for shifting cars, a towing pole, automobile ambulance, a high speed press, a motor service press, and a rear axle attachment for replacing pinions on axle.

Among the other items to be shown will be a universal axle stand, which is an entirely new design and will be exhibited here for the first time.

#### Aids to Car Washing



*Little Giant water saver and attachment for using sponge*

One department of the shop which caters to the desire for good appearance is the wash rack, which can operate to make both friends and profit. Here, however, as in the rest of the shop, the right equipment is most essential and to those interested in wash rack equipment the products of the Gaylord Manufacturing Co. of Paterson, N. J., will prove of interest, although their products are not new and have been on the market for some time.

One of these devices is known as the Little Giant, which is a type of nozzle designed to conserve water. It is rubber covered to prevent damage to the finished portions of the car and is provided with a valve operated by gripping the nozzle. As soon as the nozzle is released the valve shuts off the water. Another exhibit will be the overhead washer by means of which the hose is readily directed toward any portion of the car.

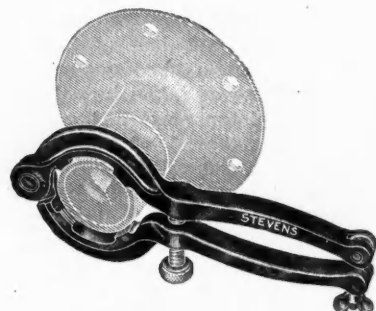
Another device is an attachment used for holding a sponge so that a continuous supply of water is passed through the sponge and the necessity of continuously rinsing out the dirty sponge is

eliminated. A combination of fittings offered at a price of \$5, includes a No. 2 Little Giant water saver, a sponge washer, a spray nozzle, a rubber hose nozzle (this provides soft flow for sponge or chamols), a spout nozzle (removes the hardest mud), and a radiator nozzle.

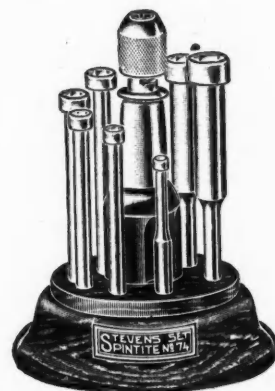
#### Speed Up Tools for Sales and Service

At the exhibit of Stevens & Company of New York there will be many items of shop equipment shown. In the line of shop equipment is an engine stand which can be completely operated by one man. The design of this stand is such that it is attached to an engine lying on the floor and then by a sort of rolling movement is worked into a position where the stand is upright and the engine supported on it. The way in which this is done will be demonstrated at the show. A comparatively recent addition to the Stevens line of speed up tools is a device for quickly recutting crossed threads on Ford front or rear hubs.

This device is made in the form of a clamp which goes over the threaded portion of the hub and cuts a clean thread as it is taken off. Another recent tool is one for conveniently holding the steering gear ball cap No. 2728 or for the front radius rod ball cap No. 2736 on the Ford, while filing or grinding the surface. Another device is the frame riveting clamp which makes it possible for one man to do a riveting job on a car frame. Other new tools include a device for easily removing and replacing the springs and spring bushings on a Ford, another for removing and replacing bearing cone on Ford front wheel spindle, also a refacing tool for Ford steering body bushings.

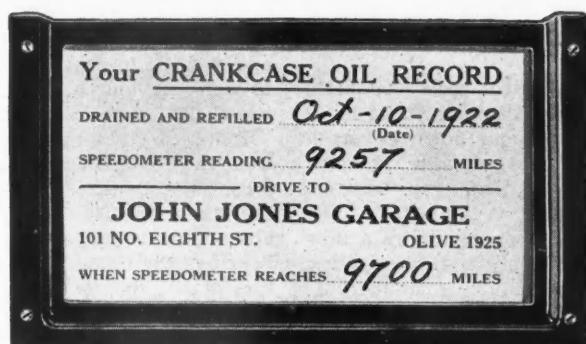


*Hub rethreader for Fords*



*Stevens Spintite wrench set*





A record card to bring the oil customer back

### Getting the Oil Customer to Come Back

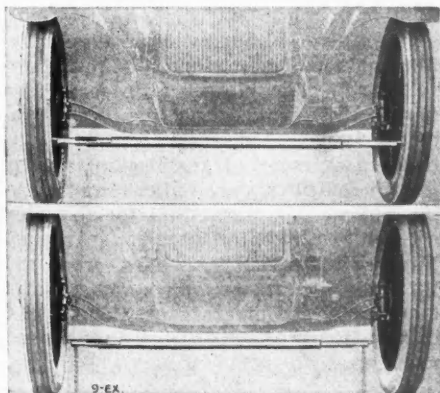
The idea of using sales slips and shop records is being recognized as of equal importance with the idea of proper mechanical equipment. To use a printed form, however, to make the oil customer come back to your shop is without doubt a new idea. A record card for this purpose is one of the products of the Comfort Printing Specialty Co. of St. Louis, the form of this card being illustrated. The object of this record card is to bring to the independent repair man and to the dealer the business which rightfully belongs to him. In many cases a dealer will put a gallon of oil into the crankcase of some car and this oil should serve for about 500 miles. If the customer brings the car back, however, after running about 250 miles, and the lubri-

cating value of the oil is apparently all gone it is evident that something is wrong with the engine. A card of this kind attached to the cowl will make it possible to check up on the operating of the oil, whereas before this was practically impossible.

Another angle of the situation is that if the owner takes his car to some other filling station or probably two or three different ones during the course of 1,000 to 1,500 miles, he does not receive the attention that he should. On the other hand with a card of this sort the owner knows just when to bring the car in, and where he had the oil put in before. In addition to this card the Comfort Printing Specialty Co. will have on exhibition a number of simple forms which make it easy to keep shop records.

### The Good Shops Are Well Equipped

In shops where they specialize on one particular car, it is possible to have equipment which is especially designed for that car. The Canedy-Otto Manufacturing Co. has separate catalogs showing the tools which are particularly useful in work on Studebaker, Buick, Willys-Overland and Jordan and while the exact



Upper view: Canedy-Otto Gage in position for first reading. Chain just touches floor and the pointer is set at zero. Gage is left in place while car is moved forward. Lower cut: Second reading, chain just touching floor and pointer registers exact amount of toe-in or toe-out.

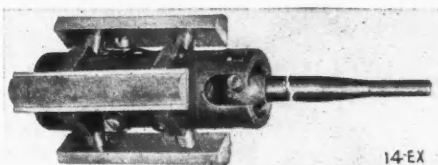
layout of the display has not been determined it is certain that the most interesting specimens from these catalogs will be there.

The car-owning public is becoming educated to the fact that not only the

best work but also the cheapest may be had in those shops which are well equipped. The Canedy-Otto line covers practically every tool that might be used in the shop. Taking for example the wheel aligning gage, the car owner will quickly see, that with a tool of this sort the job is done right, whereas in the poorly equipped shop the aligning of the front wheels is more or less a matter of guesswork.

### Reconditioning Cylinders

The temptation to neglect the cylinder is largely overcome by means of devices such as the Hutto cylinder grinder, put out by the Grinder Sales Co. of Detroit, Mich. With a device of this sort the ridges and grooves in the cylinder walls may be removed before a new piston is fitted. This device which has been on the market for about a year uses three stones which are maintained in a parallel position, regardless of the inequalities of the cylinder wall, so that there is no danger of the stones following any taper or irregularity in the cylinder. This device sells for \$37.50 with one set of stones, additional sets selling for \$3.



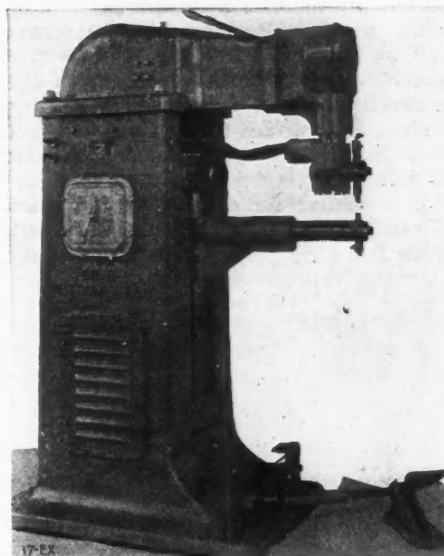
Hutto cylinder grinder

### Electric Welders for Body and Fender Work

Two electrical welding devices that will be displayed by the Gibb Instrument Co. of Bay City, Mich., are illustrated. One of these is a spot welder for handling such articles as mufflers, while the other one with the roller is suitable for joining sheets of metal. There is a field for these in the shop where custom built bodies are made and where extensive sheet metal work is handled.



Roller type electric seam welder



Spot welder made by Gibb Instrument Co.

## Proper Display Will Sell the Tools

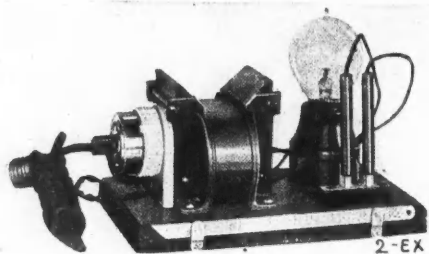
A display assortment of adjustable open end wrenches will be shown by the Crescent Tool Co., of Jamestown, N. Y. The line of wrenches is not new nor is the principle of displaying goods in this manner, but the desirability of putting goods where they may be seen and quickly sold is always of interest to those who wish to increase their profits. The display assortment known as DB9 consists of six 6-in. Crescent wrenches and six 8-in. Crescent wrenches. Three of each are mounted on the display board while the remainder are packed in individual cartons. The board measures 8½ by 11 inches and is constructed with an easel type back so as to stand up on the showcase. The 6-in. wrench retails for 75c and the 8-in. for 95c, or \$10.20 for the entire assortment. The tools are billed at the regular price of the tools alone, no extra charge being made for display card.

## New Growler and a Test Bench Lathe



The Crescent wrench display

Electrical equipment is always of interest, for there is a certain fascination about those devices that have harnessed the lightning to make the motor car a possibility. The unseen devils that make a good looking armature worth its weight as junk are ferrited out with the well known growler, a model, capable of taking armatures of various sizes being scheduled for display by the Allen Electric Manufacturing Co., of Detroit. This armature tester is narrow enough to make testing possible without remov-



Allen growler with test lamp

ing pinions or bearings and is provided with test points and a lamp for making ground tests.

In the endeavor to have complete equipment, while at the same time holding the shop investment down as much as possible, the shop manager is often confronted by quite a problem. To some extent this problem is solved for the electrical shop or department by a new lathe designed to operate in connection with the Allen test stand. An undercutter is also provided. The operation of the lathe is such that other operations performed by the stand are not interfered with.

The Allen line from which items for the exhibit are selected also includes a bearing and bushing puller, a bearing and pinion puller, a brush sander, a pole screw punch, a third brush wrench, a brush lifter, a pole piece bore gage, a pole piece screw driver, a pole piece spreader, a bearing driver, a generator and motor holding plate, an outer race puller, a Ford coil and magneto tester, a test stand for Ford machines only and a small growler.

## Gear and Wheel Pullers Save Time

Talk to any old-time mechanic who has always operated a shop on the hourly basis and he will say that flat rate charges are out of the question. "You never can tell," he will say, "whether a



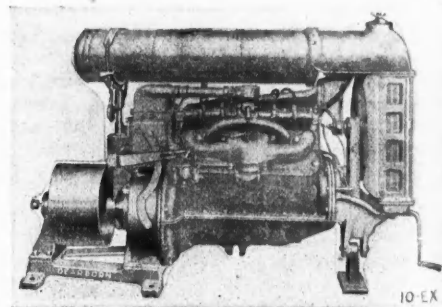
The Salesmaker of the Crane Puller Co.

job will take three hours or five, because in some cases the gears may come off easily while in other cases you may have to work an hour or two to get a gear or wheel off."

It is true that there is a slight variation in the difficulty of doing similar jobs, but this difference becomes negligible when the right equipment is available. For removing gears, wheels and bearings the Crane Puller Co., of Arlington, Mass., has a complete line varying in size and type. While now new, this line of pullers will be of interest both from a sales and shop standpoint. Where retail sales are made to other automotive shops the display stand on which an assortment of pullers are arranged will be worth considering, while the display will be equally interesting.

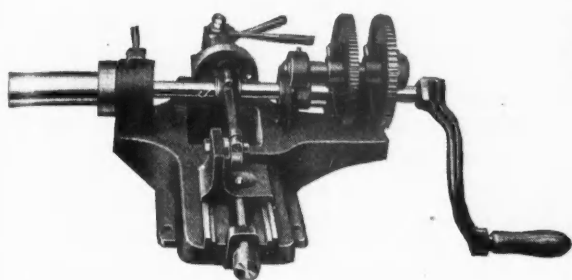
## Fordson Power Unit for the Shop

Where electrical power is not available or where the cost of current is high, it is sometimes quite a problem to get units which will develop power for operating the shop equipment. In many cases an attempt is made to use engines from old cars which have seen their best days. The disadvantage in trying to use such equipment is that the engines are not designed for delivering their rated power continuously, the bearings often being too small to stand up well. A tractor power unit, however, such as the Fordson, is designed for heavy usage and to enable service stations to use the Fordson power plant to advantage the Dearborn Equipment Co. has just put on the market a unit which they call the Dearborn Fordson Power Unit, this being a Fordson power plant mounted on a suitable frame and provided with radiator and pulley. The regular Fordson clutch is used and a hand lever is provided so that the clutch may be operated and positively locked if desired. This power unit will be on exhibition along with a number of other Dearborn products, such as the Universal burnishing and running-in machine, a motor stand for Ford, Chevrolet and Dodge engines, a Universal axle stand, Universal connecting rod alignment fixture, Universal piston clamp, bushing extractor, transmission reaming machine, Utility gear pullers, and bushing pullers, Universal radiator test plug set for the radiator repair department, Ford and Fordson tow bars, front end lift hook, Chevrolet motor stand and axle stand and a Universal crankshaft and camshaft straightening and testing machine.



The Dearborn Fordson power unit





Boring out connecting rod bearing after pouring

#### Machine for Rebabbiting Bearings

A motto which every automobile mechanic would do well to keep in thought is given in the catalog of the Hempy-Cooper Manufacturing Co., Kansas City, Mo. It is as follows:

##### Dedication

This catalog is dedicated to the conscientious mechanic whose desire is to deliver to the car or tractor owner the best possible repair service at an equitable price, thereby adding to the dignity and prosperity of his profession and establishing the confidence of his customer.

The Hempy-Cooper Manufacturing Co. has for some time been supplying the up-to-date maintenance shops with a machine for pouring and boring main bearings in Ford and Fordson engines. The

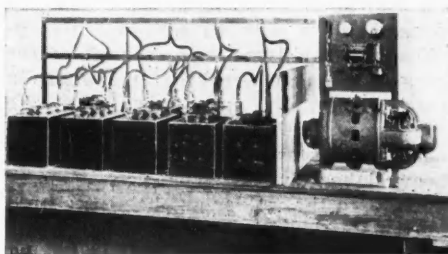


Hempy-Cooper machine for pouring bearing in connecting rod

latest addition to the Hempy-Cooper line is their connecting rod rebabbiting tool, which casts babbitt bearings into connecting rods and caps of all makes of automobiles using cast in bearings. This tool is water cooled. As originally provided the tool is supplied with one mandril for any job desired, while additional mandrills for connecting rods on other cars may be had at a nominal cost. The Hempy-Cooper line also includes two furnaces for melting babbitt, one of these being provided with a torch for melting the old bearing out of the cylinder block or connecting rod.

#### The Tight Bearings and the Dead Battery

In maintenance shops where no pretense of doing any electrical work is made, it sometimes happens that an engine is overhauled and when the job is completed it is found that the starter will not crank the engine because the battery is badly discharged. When the customer comes for the car his disappointment will be keen, for when he brought the car in the starter worked all right and now it does not and his line of reasoning is, "that the shop must have done something to the starter." Even the most logical argument may fail to convince the customer as to the exact cause of the trouble. With the idea of making such conditions unlikely, of building up good will, and making additional profit, the Marshall Electric Co. of St. Louis, has just put on the market a new constant potential charging outfit, capable of handling from 5 to 8 batteries a day, this unit being intended especially for



New Marshall constant potential charging outfit for the repair shop

the repair shop. With an outfit of this kind the battery from the car may be fully charged while mechanical work is being done on the engine or other parts of the vehicle and it is said that if an average of only three charges per day is possible that the work will pay for the equipment inside of three months. The new unit is furnished complete so that it can be mounted on an ordinary 6-foot bench in less than 30 minutes.

#### The Wrecked Car Should Not Impede Traffic

When a car has turned over or rolled into the ditch it is frequently found that traffic in both directions is held up while the wreck car occupies the center of the stage waiting to get the derelict up on the road again. With the Holmes automobile wrecker No. 250, made by the Ernest Holmes Co. of Chattanooga, Tenn., it is said that in most cases there is no need for it to interfere with traffic while working on a car that is in the ditch. This result is attained by means of two booms, one of which carries the cable which goes to the wrecked car, while the

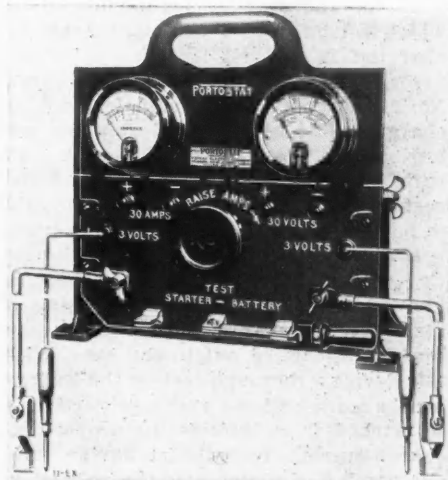


The Holmes automobile wrecker pulls a car from the ditch without interfering with traffic

other boom carries a cable which can go across the road to a tree or other object and yet at a sufficient height so that traffic is not interfered with. After the

#### Battery Charging Equipment

Those who have done any work in connecting up storage batteries preparatory to putting them on the line know of the trouble that is frequently encountered due to corrosion of terminals and clips. To overcome this difficulty the Forest Electric Co. of Newark, N. J., has developed a clip for use in connecting up batteries on the line which while not new is nevertheless of interest to all who are concerned with battery charging. The eccentric cam can be operated by the



Portostat for testing batteries



Unitron rectifier No. 2

man making the connection so as to imbed the teeth of the clips deeply into the lead post or terminal of the battery, so as to insure a positive contact. In this way no current is wasted through high resis-

car has been brought up on the road the two booms are both swung to the rear and the cables are used to raise the disabled car a few inches from the ground. A "V" tow bar is then used to pull the wreck while at the same time prevent its running into and damaging the service car. Another feature of this equipment is a set of extension legs used for the purpose of giving a rigid set-up and relieving the service car of excessive strain. The exhibit at the Automotive Maintenance Equipment Show will include all three models of wreckers made by the Ernest Holmes Co., also the "V" tow bar and towing pole.



tance caused by poor and loose connections.

The Forest Electric Co. will also exhibit a line of battery charging devices which operate on the bulb principle. These are made in a number of sizes to suit the needs of various shops and also in a small size suitable for charging one battery at a time. This latter type opens up a sales possibility to those concerns which have added radio to their automotive line.

In the garage type unit there are two which make a special appeal. One of these is known as the Unitron No. 1, which sells for \$117 and is capable of charging 15 six-volt batteries at 6 amperes. The other is known as Unitron No. 2, and contains two bulbs capable of charging 30 batteries at 6 amperes are less. With either of these devices and with the unit operating a full load the cost per six-volt battery per hour is said to be less than  $\frac{1}{2}$ c for the current used.

Another product of the Forest Electric Co. suitable for the battery shop is known as the Portostat, this being a high rate discharge outfit which can readily be carried out to the car. With this device a thorough test on the battery can be made and the ammeter portion is so marked as to indicate the proper discharge current for batteries having various number of plates. On the voltmeter, indications are given which show the general condition of the battery as well as the actual reading in volts, while marks are shown on the scale for the purpose of making cadmium readings.

### Kellogg Products

A convenient air and water tower which will be exhibited at the show is one of the products of the Kellogg Manufacturing Co. of Rochester, N. Y. This

air and water tower is electrically lighted in such a way that the light is reflected through opening in the letters which read "Free Air." The hose arm may be pulled down in any direction without having to turn the hose or swivel head, in this way giving the speediest possible action in service to several customers whose cars are located in different directions from the station. When released the hose arm returns to its normal position, the latter portion of the motion being checked so as to prevent the hose whipping past the stand.

Another new product scheduled to be shown is model EM-62 air compressor, this being designed to furnish an unusual volume of air for use in the largest shops where many pneumatic devices are used. It furnishes 150 pounds of air and has a displacement of eight cubic feet per minute, while in two oversizes which are available the displacement is 11 cubic feet and 14 cubic feet respectively. Another device which will be on display is a paint spraying compressor designed to handle the new Duco paint.

### New Welding Outfits

While the maintenance of cars involves the intelligent use of new parts to a great extent, it is also true that much profitable work is to be had where welding can be resorted to in order that expensive parts may be saved. This applies to conditions encountered where cars have been wrecked, and where a good welding job on a frame may save the owner of the car, not only the purchase of an expensive item but also a heavy labor charge. Two new items of interest to the welder are being featured by the Bastian Blessing Co., of Chicago, these being their Model GM and Model

GS Rego welding torches, both of which will be on display.

The former handles medium size work, being suitable for welding iron, steel, copper, bronze and aluminum up to 1 in. in thickness, while the smaller model is used for work up to  $\frac{1}{8}$  in. thick. The Bastian Blessing exhibit will also include their Rego Model K cutting torch, regulator and other items, demonstrated for the benefit of those who are not familiar with all of the possibilities of equipment of this nature.

### Belt Lacing Device Reduces Stock Carried

To reduce the amount of stock necessary in order to take care of the fan belt requirements of all cars the Clipper Belt Lacer Co. of Grand Rapids, Mich., has put on the market a simple belt lacing device. This is made in two styles, one of which uses the pressure obtainable from an ordinary vise in order to operate the jaws which force the wire lacing into the belt. The other device, which is illustrated, is complete in itself and by the operation of the handle puts the wire lacing in place. With both ends of the belt so equipped the simple application or removal of a pin either connects or disconnects the belt. The Clipper Belt Lacer Co. also can furnish a tool known as an open end clipper belt cutter, this being designed for cutting belting from the roll or for squaring up belt ends preparatory to lacing. This device is so designed that the knife can only be raised a short distance which practically eliminates danger of the operator cutting his finger or hand. It is pointed out that with belt ends properly squared all undue strains will be eliminated from the belt and its lacing, giving smoother operation.



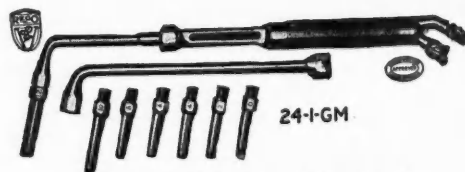
Kellogg air and water tower



Kellogg model EM-62 compressor



Model G S Rego welding torch



Model G M Rego welding torch



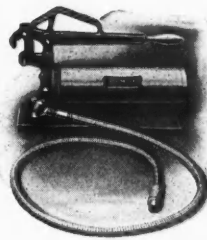
Open end Clipper belt cutter



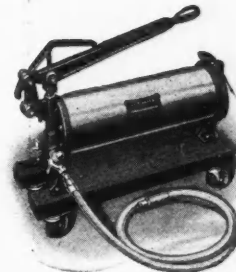
Clipper belt lacing machine

### A Twist Type of Grease Gun

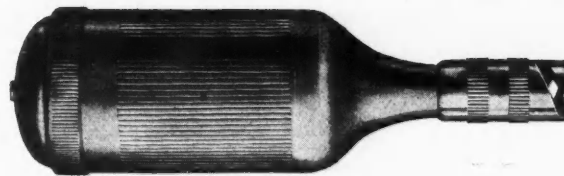
High pressure methods of lubricating the chassis are recognized as prolonging the life of the car and there are a number of devices on the market suitable for this work. A new one, developed by the Bassick Manufacturing Co., of Chicago, makers of Alemite, will be exhibited for the first time. It is known as the twist gun for the reason that the whole gun is turned to force grease in, instead of employing a handle of some kind. In turning the gun to the right high pressure is developed in the nosepiece or coupling of the gun, which forces lubricant to the fitting. When the gun is turned the other way a vacuum tends to form in the nozzle, but due to the fact that atmospheric pressure is admitted to the body of the gun, additional grease is driven into the nozzle. Accordingly repeated twisting of the gun back and forth results in forcing any amount of lubricant desired into the bearing. In this way pressures up to 2500 pounds may be developed, while with the screw-



Little Giant compressor



Giant compressor



The Alemite twist gun

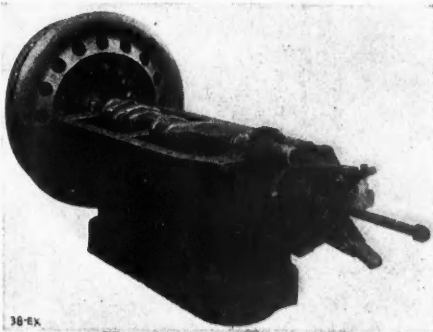
operated device called a booster, the nozzle pressure may be increased to 5000 pounds.

From the service station standpoint the Alemite portable compressors are of even greater interest, although not new.

Two of these, however, have been placed on the market comparatively recently, these being the Little Giant Compressor, known as model H-5, and the Giant Compressor, or model H-17, these compressors being of the horizontal type.

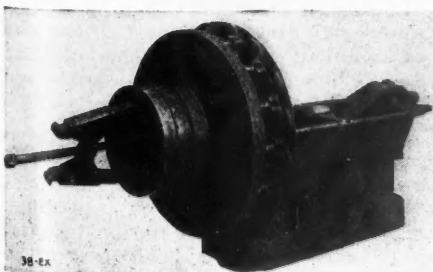
### Ford Gear Puller With Hardened Screw

A gear puller designed to do a great number of jobs on Ford cars is made by the George L. Hunt Manufacturing Co., of Boscobel, Wis. This puller is provided with jaws which are so shaped that the harder the pull the tighter they grip, these jaws being hand forged from a spe-



Hunt special Ford puller, removing camshaft timing gears.

cial quality S. A. E. specification steel. The bolts used in the Hunt pullers are especially made and after the screw has been formed it is heat treated. The process by which this screw is made is said to be such that it can be used as a rat-tail file on a Ford axle shaft with-

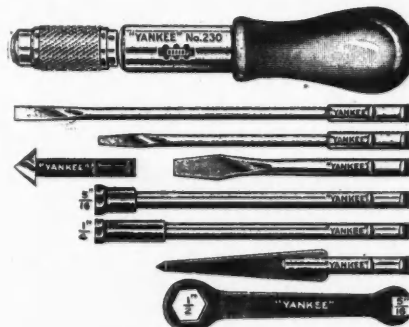


Hunt special Ford puller removing transmission high speed drum.

out damaging the threads. While the Hunt pullers are made in a number of sizes, the latest addition to the line, the Ford special gear puller, will probably attract the greatest attention. The jaws of this puller are provided at one end with pins for pulling the high speed disc drum on the Ford transmission. Then by reversing the jaws and using the slug furnished it will pull the driven gears. The same puller will pull the crankshaft timing gears, the camshaft gears and the differential gears on a Ford car.

### High Speed Screw Drivers

The spiral type screw driver, well known as the "Yankee" and put on the market by North Bros. Manufacturing Co., of Philadelphia, Pa., has made many friends. The principles involved in its construction have also been extended to a variety of tools useful in the automo-



Yankee radio tool set.

bile shop as well as where wood screws only are used.

The exhibit at the show will include a wide variety of tools, among them the No. 1530 hand drill, Nos. 1555 and 1545 ratchet breast drills, Nos. 90 and 95 plain screw drivers, No. 75 push brace and a rather distant relative of the ratchet

principle, a brake lining cutter known as No. 2000. These tools will appeal to the man in the automotive shop, but in the sales department, where small items add up to big amounts, the "Yankee" radio tool set will prove of interest. When the handle of this outfit is moved back and forth, the tool is able to countersink, ream, drive screws or tighten nuts, for two socket wrench attachments are provided with the set, as well as several screw driver bits, a countersink, a wrench and a reamer attachment.

### An Ideal Electrical Service Station

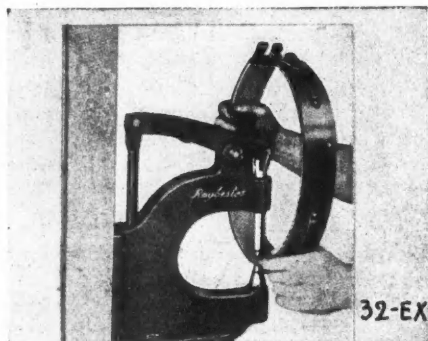
The exhibit of the United Motors Service, Inc., at the Automotive Maintenance Equipment Show will be of an educational nature. A model shop complete in every detail will be shown. This will be equipped with all of the special tools and machinery needed to operate an electrical department or an electrical service station. Some features of the display will be moving and there will be an experienced and highly competent man in charge of the exhibit to answer questions and to perform interesting tests, as well as to possibly do some electrical service repair work during the show. It is planned to have a work bench, a lathe, an electrical test fixture, a growler, an undercutter, a drill press, a grinder and an arbor press. It is the intention to use a Neeco test fixture made by the Neal Electrical Company of Detroit.

It is also planned to have on exhibit a map of the United States and Canada, showing by means of different colored tacks the location of the 8,000 service representatives of United Motors Service. Subject to the approval of the show committee, is also the intention to reproduce the front of a typical service station with its show-window and drive-in entrance by using especially painted scenery, to carry out the effect.



### Profits in Brake Lining

The properly equipped shop can quote a reasonable price for relining a set of brakes and at the same time make money on the job. The Raybestos Co. of Bridgeport, Conn., will exhibit not only their own product, which is brake lining, but also machines which they recommend for doing good work and which may be obtained from them. The rivets are first punched out and the old lining removed. New lining is cut to the correct length and the holes located, drilled and countersunk. The attaching of the lining snugly and smoothly with a riveting machine is but an incident, for with a machine of this kind but little experience is needed.



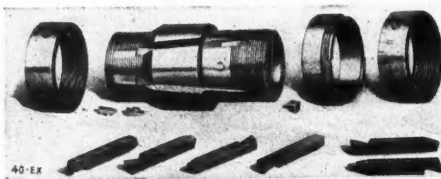
Using the Raybestos machine leaves both hands free to hold the band in place

The Raybestos method of relining bands, includes the use of tubular brass rivets which this concern is able to supply. As brass coated steel rivets are often put on the market as brass rivets it is well for the repair man to scratch the surface of rivets he is buying and see what they really are made of or else to secure rivets from some reliable concern. For the convenience of the man who relines brakes the Raybestos Co. has put out a brake lining kit, which contains all tools necessary, except hammer, vise and hand drill. This kit includes the drill, tubular countersink, taper countersink, anvil, hollow rivet set, tubular rivet set and an assortment of tubular rivets most frequently required.

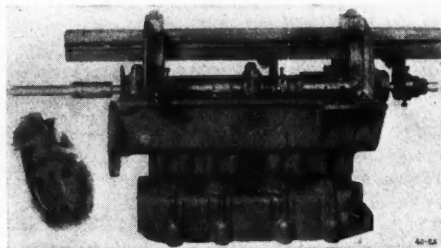
### Reamers That Do Not Chatter

Skill will go a long way toward producing a good job, but to the extent that the tools and shop equipment have been made fool-proof, will it be possible to turn out good jobs with men who are still lacking in some of the fine points of mechanical work. The conventional reamer if slightly dull or if not carefully handled may exhibit this tendency, which is said to be practically eliminated in the Martell reamer made by the Taft-Pierce Manufacturing Co., of Woonsocket, R. I.

Six blades are used in this type of reamer, and these are arranged in pairs, the blades of any one pair being diametrically opposite to each other. One pair of blades forms a right-hand angle with the axis of the reamer while the other two pairs of blades form left-hand angles. The diametrical arrangement of



Martell adjustable reamer.



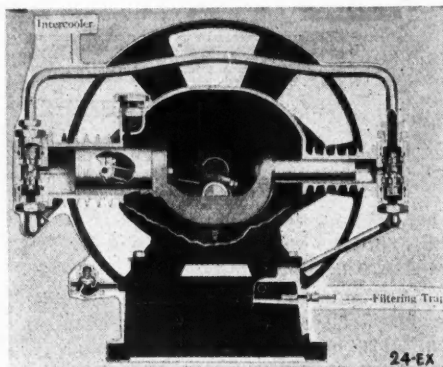
Taft-Pierce Durant main bearing reamer.

the blades in pairs makes it possible to calibrate pairs of blades throughout the entire length and thus determine the accuracy of grinding or adjustment. This construction gives the same effect as a spiral reamer with an odd number of teeth and eliminates chatter.

It is intended that the display of this concern will include equipment for main bearing reaming on a number of makes of cars, the Chevrolet and Durant equipment being comparatively new. One feature of the main-bearing reaming equipment is that the timing gears are properly meshed before the reaming job is started, the crankshaft gear being located on the reamer shank for this purpose. In this way it is assured that the crankshaft will be so located that the meshing of the gears must be right.

### Two Stage Air Compressors

It is commonly recognized that heat is produced when air is compressed. If an ordinary hand operated air pump is used to inflate a tire it will be found that the lower portion of the pump soon becomes quite warm while the upper portion is still cold. This is due to the fact that compression of the air is greater at the lower portion or outlet. This same principle affects the design of power equipment for compressing air on a large scale, and where the volume is great and the pressure high it is sometimes

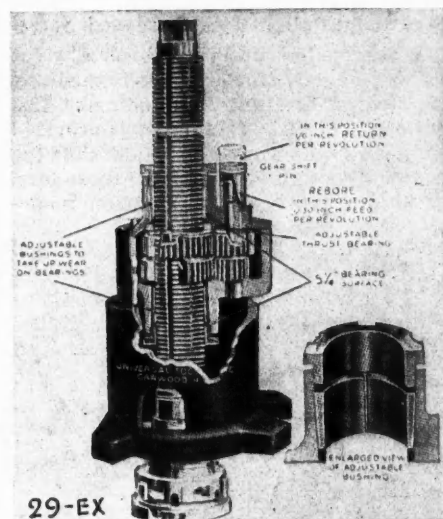


Usaco air compressor illustrating the two stage principle

considered desirable to compress the air in two stages so as to reduce the heat produced at any one time and also for the purpose of reducing the load on the mechanism.

The two stage principle is exemplified in one of the larger units made by the United States Air Compressor Co. of Cleveland, Ohio, for use in garages, service stations, and gas stations. In the illustration which shows one of the Usaco two-stage air compressors it can be seen how the low pressure air is taken in at the left and is driven through the intercooler to the cylinder at the right. The inter-cooler is a copper pipe which rapidly dissipates heat from the air. In the right hand cylinder, the air which is at a pressure of some 40 pounds is raised to its final pressure for use in inflating tires and operating pneumatic equipment. While the products of this company are not new they are nevertheless of interest and among the units that will be on display will be an L. B.-5 heavy duty water cooled air compressor, as well as a Standard DeLuxe automatic air unit.

### Diversified Display



Universal machine for reconditioning cylinders

The display of the Universal Tool Company at the Automotive Maintenance Equipment Show will be of an educational nature, featuring a large number of items of equipment used in reconditioning engines. This will take in not only those devices made by the Universal Tool Co., but also tools made by other concerns. The display will include electric drills, valve grinders, cylinder gauges, valve refacing tools, connecting rod aligning gauges, carbon cleaning brushes, micrometers, light stands and similar items of equipment.

An assortment of replacement parts which the repair shop should have in stock to render service of this kind will also be shown, including pistons, rings, wrist pins, valves, push rod guides, gaskets, bearings, shims, bushings, timing gears and similar items. More than 70 manufacturers will be represented in the Universal Tool Co.'s exhibit.



### Making the Electric Drill Supply Shop Power

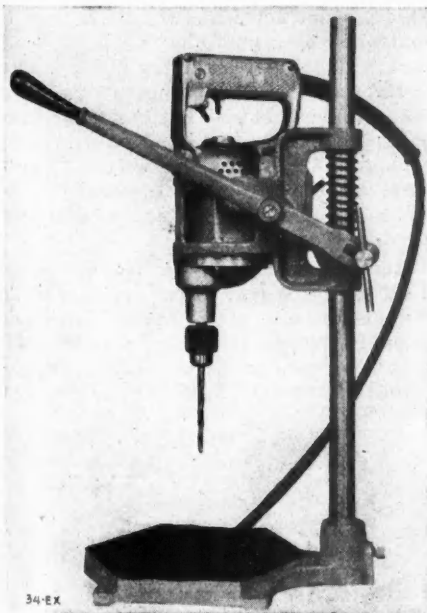
It is some times the experience of executives in charge of automobile maintenance stations that it is not sufficient to buy the right equipment, but it is



Using Black and Decker drill to operate a cylinder hone

also necessary to see that the mechanics in the shop use the equipment and use it to best advantage.

With the idea of demonstrating the various uses to which an electric drill



The portable electric drill made into a drill press

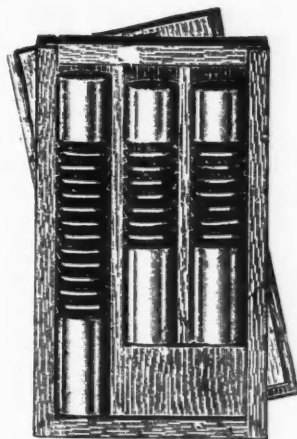
may be put the Black & Decker Manufacturing Co. of Baltimore, Md., has hit on this idea for its display at the Auto-

motive Maintenance Equipment Show. The exhibit will include actual demonstration of a great number of jobs that may be done by the use of an electric drill as a source of motor power, including the way in which the drill can be used in honing cylinders, operating wire brushes for cleaning carbon from any engine, operating re boring tools, driving glass cutters for inserting windshield-type spot lights, supplying motive power for brake lining machines and for operating valve guide reamers and tire buffers. From the display contemplated it seems that the electric drill is capable of being used for purposes other than drilling more than for actual drilling of holds.

In addition to the exhibit which will show the drill in action as thus indicated there will be a semi-finished closed automobile body for use in demonstrating electrically operated screw drivers. The electric screw driver is a big factor in efficient and economic assembly of an automobile body and this demonstration will make it possible to see just how the work is done.

### Relining Brakes by Machinery

It is the intention of the Sheldon Machine Co. of Chicago to exhibit at the show a brake lining machine that will handle either external or internal linings,



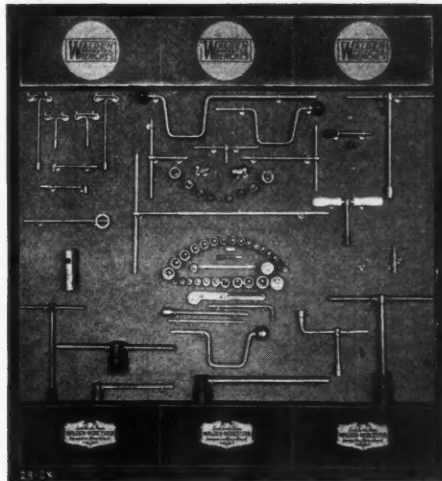
Sheldon broaches for piston pins

this being mounted on a cast iron plate and provided with either an A. C. or D. C. motor. In the operation of this device the old rivets are removed by a spinning process, the lining is counterbored while another tool spins the rivet in.

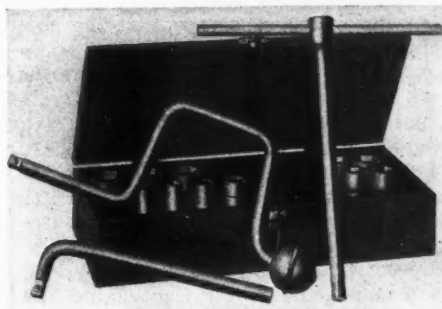
This company also makes an extensive line of broaches for properly fitting wrist pins to the piston. Due to the fact that wrist pins will vary somewhat in size the broaches are furnished three to a set, there being a slight variation between the three as far as diameter is concerned. These broaches are made for practically all standard and oversize wrist pins. Tools are also available for pressing bushings in and out of the piston and for use in connection with the operation of broaches in the arbor press.

### Flat Rate Sells Shop Tools

A convenient socket wrench set designed for the use of individual mechanics has been recently marketed by Walden-Worcester. It comprises a con-



Display board showing Walden-Worcester wrenches



Walden-Worcester socket wrench set designed for use of individual mechanics

venient case for keeping the various sockets which are selected to meet all average requirements, also a brace handle, a tee handle and an offset handle.

The sockets supplied with this set are broached 1/64 inch over the size of the nut to be handled. The sockets are also counter drilled making extreme depth of sockets one-half inch more than the thickness of the nut. The broached end is countersunk slightly to relieve the square edges and to allow more rapid placing of socket on the bolt head. All sockets are heat treated. There are a number of other attachments which may be obtained to be used in conjunction with this set, one of these is a ratchet wrench which is turned over to reverse the direction in which the socket is turned. Another device is a plug connector, for making connections between various units, while a third item is a universal joint for working in awkward corners.

The line of Walden-Worcester wrenches which is quite well standardized will be best seen by means of the display panels on which various wrench assortments will be shown.

### Good Wrenches Speed Up Flat Rate Work

SIZES OF SCREW-BOLTS-NUTS			
Socket Sizes	SAE	Cap Screws	Cap Screws
14	7/16	1/4	1/4
16	1/2	5/16	5/16
18	9/16	3/8	3/8
19	19/32		5/16
20	5/8	7/16	7/16
22	11/16		3/8
24	3/4	1/2	1/2
25	25/32		7/16
26	13/16	9/16	
28	7/8	5/8	5/8
30	15/16	3/4	3/4
32	1	1 1/8	1 1/8
34	1 1/8	1 1/4	1 1/4

39-EX

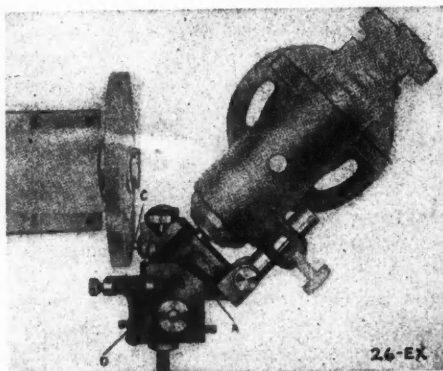
Left—Instructions showing sizes of bolts and nuts on which wrenches fit. Right—Fawcett wrench display board.

In the endeavor to see that the shop contains all of the large pieces of equipment which can profitably be employed, such as axle and engine stands, there is a possibility that the need of the right kind of small tools will be overlooked. The flat rate method of charging for jobs, together with reduction in time necessary to make ample profits, requires that the most up-to-date methods be employed. The question of whether the shop management or the mechanic himself makes the investment in small tools is one which each individual shop manager will have to work out for himself. The Fawcett Wrench Co., of New York City, maker of a complete line of socket wrenches, has presented the thought that it would be economy for the shop management to provide the necessary small tools, such as socket wrenches, inasmuch as the cost would be made up in a short time due to the saving in time on the various jobs. The line of wrenches to be displayed by this company is practically standardized and their service covers not only the furnishing of tools of various types but also information as to the places in which these tools can be used. Another angle of the wrench question is that of direct sales over the counter to mechanics and car owners and for this purpose various display boards are available.

### Sharp Tools Are Good Tools

The Van Norman Machine Tool Co. of Springfield, Mass., will exhibit their grinding equipment which makes it possible to keep tools, such as valve seat reamers, in proper condition. Their model B grinder which is one of the devices to be exhibited at the show, is an outfit which grinds both valves and cutters. Using the same grinder to grind the valve and the cutters which form the seat results in practically eliminating a major portion of the work of valve grind-

ing by means of compound and elbow grease. The Franklin Model B grinding outfit is also used to recondition burned ignition contacts and to true up worn push rod studs or valve lifters. It is also used to automatically reseal Buick valve cages and by means of a special

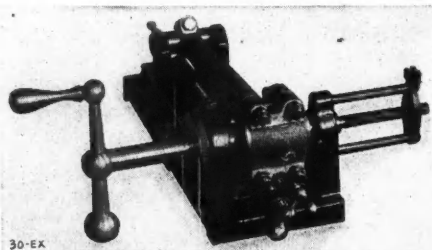


Truing up brake contacts in the Van Norman Model B Grinder

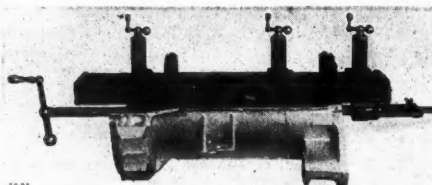
attachment carbon deposits in the cylinder head can be quickly removed, the attachment in question including a flexible shaft with a wire brush to rapidly loosen the carbon. The line of equipment to be exhibited also includes the Van Norman Re-li-o grinder for use on such work as pistons; also a larger grinder known as Valvo, designed for rapid and accurate work on valves.

### Bearing Fitting Tools

The W.A. Manufacturing & Sales Co. of Bloomfield, N. J., will exhibit fixtures for properly fitting both main and connecting rod bearings and with these devices it is said that a complete bearing job may be handled in from four to six hours, depending upon the size and make of crankcase and connecting rod. The bearing is finished without any scraping whatever, the result being a perfectly refinished surface and perfect alignment throughout. The tools for this service are made with the highest precision workmanship possible, the boring bars, bushings and similar parts being hardened, ground and lapped.

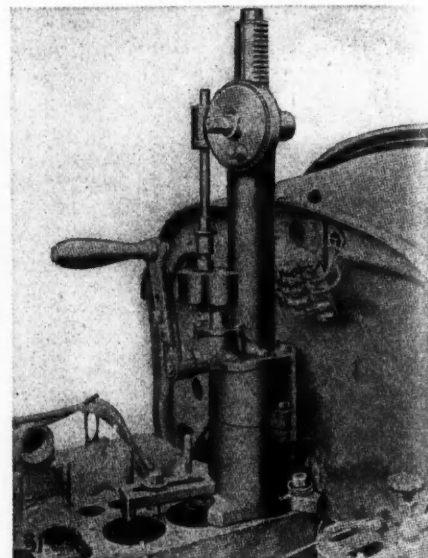


No question about the connecting rod alignment when this machine has finished its work.



W.A. main bearing equipment in action

### A New Cylinder Boring Tool

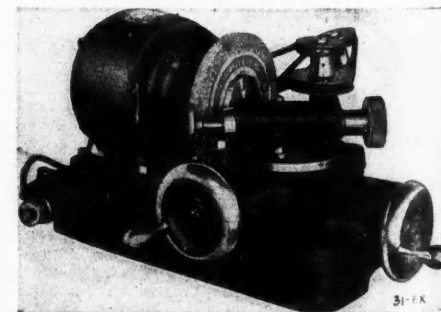


The Wayne boring machine in action

Time and economy are big factors to be considered on all work done in the shop. The saving of time means the possibility of meeting competition, with prices that make profits possible. On engines which have detachable cylinder heads, refinishing of the cylinder bore without taking the engine block from the car is becoming more and more popular.

A new tool for this purpose is known as the Wayne boring machine and will be shown by the Wayne Tool Manufacturing Co. of Waynesboro, Pa. This machine will handle cylinder work on practically any motor car, truck or tractor and is capable of handling diameters ranging from 2 1/2 inches to 5 inches. No guide rings are used, for the machine is very rigidly constructed and the boring bar is controlled by a guide having three bearings which insures having the cylinder at right angles with the upper surface of the cylinder block. This machine may be operated either by hand or with power and the power drive may be either from an electric motor designed especially for the purpose or by using an electrical drill.

Another new item of Wayne equipment is the Wayne valve grinder, while the exhibit will also include adjustable reamers, Wayne valve seat reamers with expansion pilot and the Wayne bearing mandrel.



Truing up valves in the Wayne grinding machine

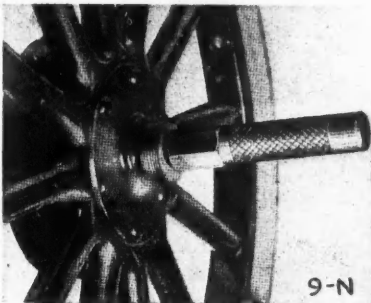


# New Equipment for the Shop

In addition to the automotive maintenance equipment which will be exhibited at the Detroit show next week a number of new devices are being announced at this time by manufacturers independently of the exhibition. On the following pages some of these items of shop equipment are described and others will be described in later issues of MOTOR AGE.

## Saving the Axle Shaft

It is well known that the rear wheel of a car may be loosened from an axle shaft by striking the end of the shaft with a hammer. Due to the inertia of the wheel the shaft is driven from it, but this method often damages the end of the shaft and spoils the threads. The National wheel puller, made by the National Machine & Tool Co. of Jackson, Mich., makes it possible to use this general method of taking off a wheel and yet without danger of injury to the shaft. The puller is made of high grade steel and is screwed to the end of the shaft until the bottom of the puller strikes against the end of the axle. The two solid ends thus brought together entirely protect threads of the shaft, the shaft striking the bottom while there is still one-eighth of an inch remaining between the puller and the hub. This puller is particularly recommended for removing wire wheels which are ordinarily difficult to remove because the end of shaft sets far back in the hub. Other recent shop tools put on the market by the National Machine & Tool Co. include a drive shaft sleeve puller, a piston pin bushing remover and replacer, a drive shaft sleeve driver and Ford axle gear driver.



National wheel puller

## Saving Time on Body and Fender Work

When the tow car has done its work or the wrecker has brought a car into the shop, it usually means a job on frame, axles and engine. This is not the only work, however, that the wrecking car brings in, for fenders and bodies often suffer more than the merely mechanical parts of the automobile. When damage is not great it is often merely a case of bumping out dents or frequently in the case of fenders heating the damaged parts, and working them back into shape, in some cases involving a weld to strengthen a weakened point. After repairs of this kind have been made it is of course necessary to smooth off the surface which is often done laboriously by filing. The R. G. Haskins Co. of Chicago has put on the market a new portable grinding outfit which incorporates an electric motor and a flexible shaft,

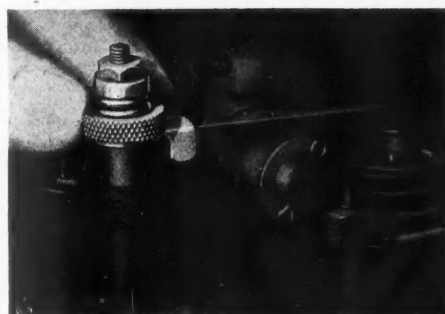


Using the Haskins portable buffing outfit to smooth up a fender, after repairing

on the end of which it is possible to mount any one of a number of units. For rough work a grinding wheel may be used or for smoothing up a standing drum is mounted. The same portable grinder, of course, will come in for a variety of jobs, such as cleaning out carbon, when the device is equipped with a suitable brush. In the tire shop the same outfit can be used in buffing out the inside of the tire without the exertion of holding the whole tire up to the buffing wheel.

## Rapid Valve Adjusters

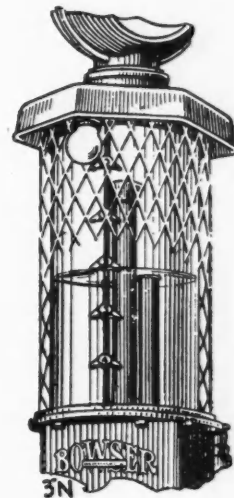
A new device is being put on the market by the Gemco Manufacturing Co., Racine, Wis., which should make it very easy to rapidly adjust valves on overhead type engines such as Chevrolets. The illustration of this device speaks for itself. By means of a narrow knurled dial which can be turned with the thumb and finger the proper clearance is quickly obtained. Each notch on this dial represents one thousandth of an inch so that the dial may be turned until there is no clearance and then turned back again the necessary number of notches to give the recommended clearance. From the standpoint of the automobile dealer a device of this sort should find ready sale to those car owners who are interested in keeping their engines running smoothly.



Gemco rapid valve adjuster

## New Equipment for Selling Gas and Oil

An improved type of visible gasoline pump is being marketed by S. F. Bowser & Co., of Ft. Wayne, Ind. This pump is hand-operated and definitely measures the amount of gasoline which flows through the hose. The glass cylinder contains a sliding tube which according to its elevation in the cylinder permits the discharge of various quantities of gasoline at the will of the operator. This sliding discharge tube is brought to the desired level by engaging the operating mechanism with a positive quantity stop so that there is no possibility of incorrect measurement.



New Bowser gas pump

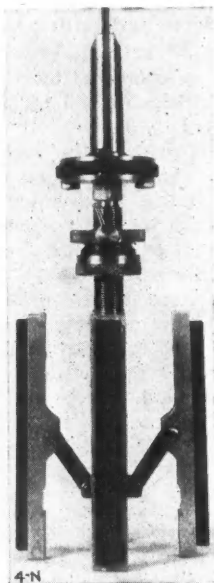
An interesting device available in connection with the gasoline pump is the Bowser recorder or flow meter which maintains a continuous record of the amount of gasoline which has been sold so that it is a simple matter to check up the cash against the sales of gasoline. A third piece of equipment for the gasoline and oil department is an oil tank and pump combination for use in making retail sales. This device makes accuracy easy and prevents leaks which eat into profits.

## A Welding Torch for the Difficult Job

A new type of torch, known as the "Sheet metal torch," has recently been brought out by the Alexander Milburn Co., of Baltimore, Md. In this device the head has been eliminated, the tip screwing onto a threaded curved tube. This makes it possible to work in tight corners and places around and under the car which are very nearly inaccessible. The design of the gas passages is such that there is no danger of back fire or flash back. It is said that it is even possible to put the tip of the torch into molten metal and it will not flash back.

## A Hone to Use After Reaming

For giving reconditioned cylinders a smooth finish to promote long life, the Campbell Auto Works of Stockton, Cal. has developed a cylinder hone which takes care of diameters ranging from 2 3/4 in. to 5 in. This concern does not recommend the use of the hone until the

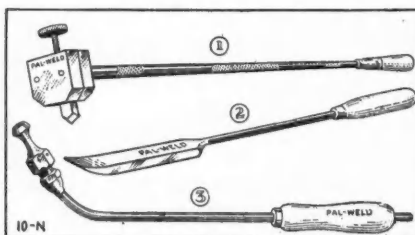


Essential details of Campbell cylinder hone

cylinder has been trued up by means of re boring, but does recommend the hone in order to quickly put the engine in running condition. The adjustment for various diameters is made with a narrow knurled collar beneath the driving spindle, which makes it possible to expand or contract the expansion arms without removing the driving spindle or removing the hone from the cylinder block. It has only one spring, controlling the expanding arm so that the tension is maintained equal on all arms. The spring tension is so arranged that expanding or contracting the arms does not change the spring tension. A thermoid disc is used for the flexible coupling.

## Compound for Repairing Scores in Cylinder Walls

A scored cylinder is a misfortune which affects not only the buyer of a used car but the dealer who sells it also. From the buyers' standpoint, the condition makes the car run poorly and makes him feel that all dealers in general and the one who sold the car in particular are enemies of humanity. On the other hand it is usually a rather expensive job to properly repair a scored cylinder. The Pal-Weld Manufacturing Co., of Seattle, Wash., has placed on the market a new compound which, it is said, can be used to solder scores or familiar defects in cast iron without even the necessity of cleaning beforehand. The compound operates to not only clean but also acts as a flux, in addition to containing material which fills up the score. For best re-



Tools used in preparing score in cylinder wall for applying Pal-Weld

sults, a crack in cast iron should be deepened so as to make a narrow deep opening into which the compound may be worked. It is then necessary to perfectly tin the surface, keeping the soldering iron hot, by means of a blow torch. After the surface of the metal has been perfectly tinned additional amount of compound may be used to fill up the crack.

## A New Heavy Duty Crane for the Wrecking Trucks

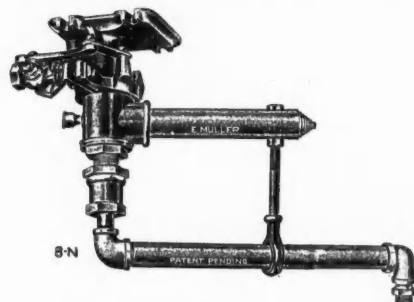
A simple but efficient piece of equipment designed for use on a wrecking car is being put on the market by the Wood-Imes Manufacturing Co., of Minneapolis, Minn. Instead of the exposed gears often seen in equipment of this sort it is equipped with an epicyclic gear which with the 15-in. crank used gives a leverage ratio of 174 to 1. By means of this construction there is practically no danger of dropping the load due to the breakage of a gear tooth because approximately 12 teeth are constantly in mesh rather than one tooth as in the ordinary spur gear construction. The steel shaft of the winch, which is 1 1/2 in. in diameter, revolves on heavy roller bearings that are housed in self-aligning races, their construction giving very easy operation. The boom is hinged at the base and is adjustable to several different heights, giving any desired degree of overhang. A knob adjustment on the drum permits a rapid spooling or unspooling of the chain and saves operator both time and tiresome work. The positive spring lock on the drum prevents the load from slipping or dropping when being raised or towed and it is a safety factor against impact shock.



Wood-Imes heavy duty crane

## Improved Wash Rack Equipment

An improved type of overhead washer for use in automobile maintenance stations has been recently put on the market by Edward Muller of North Bergen, N. J. The hose arm in this outfit is made of galvanized pipe, revolving on swivel bearings which are made of brass and babbitt metal, and is supported by a shorter arm, thus taking all the strain off of the swivel bearings and preventing



Muller Model 15, automatic overhead washer

leakage. The washer is equipped with an automatic cutoff which permits the regulation of the supply of water from a thin stream to a powerful flow. This feature results in a saving of both time and money, for it is estimated that water bills are cut in half where a device of this sort is used.



The new Hoyt cell tester  
New Storage Cell Tester

In the sale and repair of batteries and in checking up other electrical equipment on the car, it is a matter of considerable importance to know whether the battery is in good condition or not. A new Hoyt cell tester being marketed by the Burton-Rogers Co. incorporates a number of interesting features. The resistance is a ribbon of special metal having .02 ohms resistance, which will not vary with heat. The meter reads 50 amperes for every one volt drop in the cell and can be removed from the brackets and used as a pocket meter. When in use on the tester the meter is so arranged that it can be revolved to any position. The prongs are of steel but are lead coated so as to be unaffected by acid.



## The Shop That "Knows How" Gets the Profits

# Servicing Clutches and Transmissions

*Misalignment of These Units Chief Cause for Their Misfunctioning. Essential That Maintenance Shop Have Proper Testing Devices to Ascertain Condition of Flywheel and Its Housing. How to Make Bearing Adjustments on Transmissions*

By H. A. PIERCE\* and B. M. IKERT

**O**FTEN in servicing a car or truck most of the maintenance work is performed on the engine in the hopes that any irregularity of performance in the vehicle will thereby be eliminated. Even though much work very often is done on an engine the fact of the matter is that the car or truck still does not run as well as desired.

A vehicle may come in for adjustments or repairs on a rear axle which seems altogether too noisy. There may be excessive play in the drive shaft and universals which make the vehicle run poorly, especially in starting and in slowing up.

Various remedies are applied but all this time the mechanic often overlooks the fact that the clutch and gearset, the two units interposed between the engine and rear axle, in reality become part of the driving and driven members and must, therefore, be functioning properly if smooth action of the entire vehicle is to be obtained. It must be remembered that the clutch shaft is essentially an extension of the crankshaft and likewise, the transmission shaft becomes part of the drive shaft when the engine drives the car.

It will become at once apparent, then, that any lost motion or misalignment of either the clutch shaft or transmission shaft will affect the operation of the vehicle.

In the past many clutches and gearsets have been condemned, not so much because these units were no good, but because they usually were improperly installed. Often it is the fault of the car maker who does not hold the clearances on the units close enough, or it may be caused in assembly of the units (speaking now of the unit-powerplant) in that they are not lined up properly, with the result that the clutch shaft runs out of true with the crankshaft and also causes the transmission mainshaft to run out of true sooner or later.

We have seen cases where a car has come in with supposedly clutch trouble. The units are taken down and a new clutch installed. It happens that after a few hundred miles the owner comes in with the same difficulty. Naturally

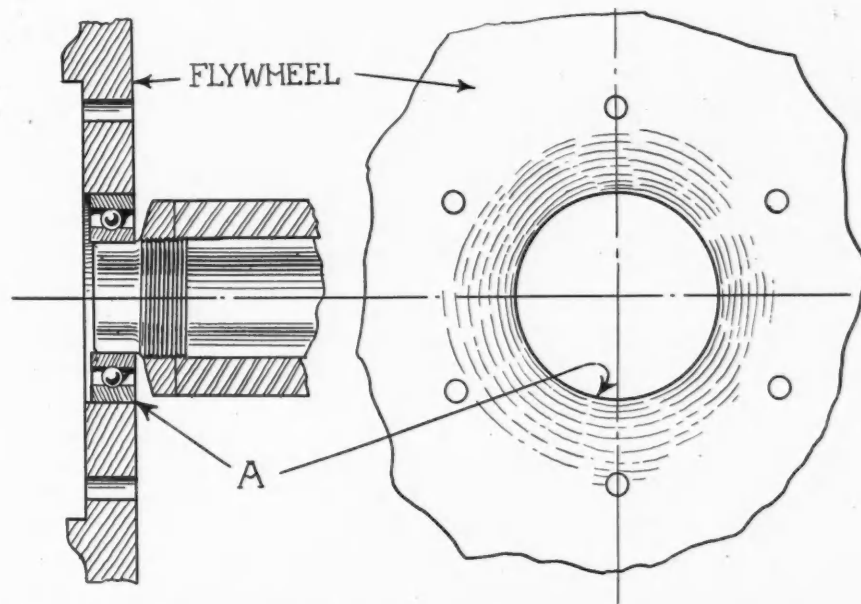


Fig. 1—The fit of the clutch pilot bearing into the flywheel recess A is very important and the recess in the flywheel must be held concentric to .004 in.

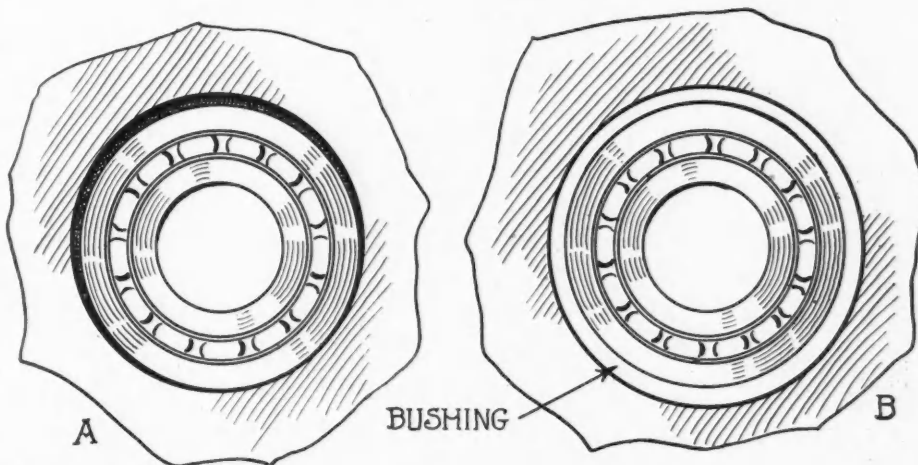


Fig. 2—At A is shown the result of having the pilot bearing a running fit in the flywheel recess. The proper remedy in this case is to remove the flywheel, enlarge the recess for the pilot bearing and then fit a bushing, as at B

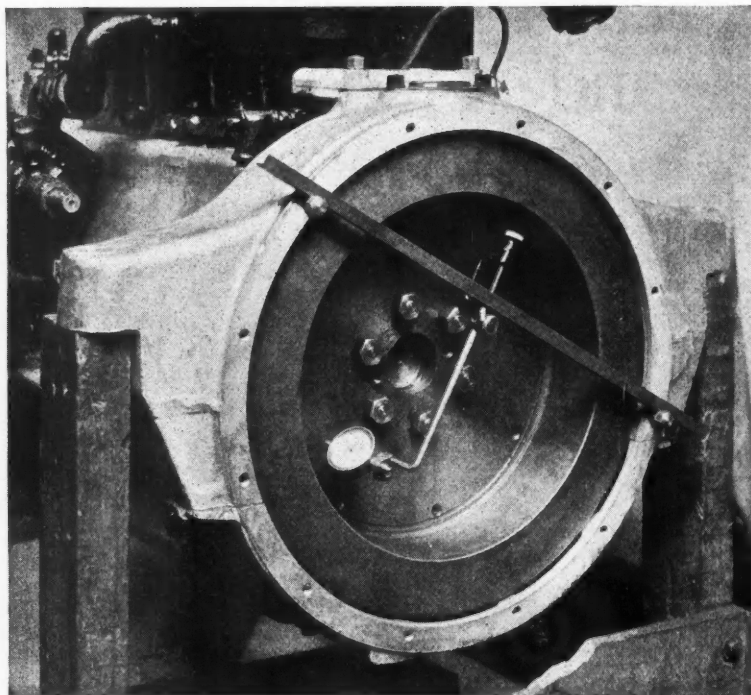
the clutch is suspected of being at fault, when in reality the trouble is in the misalignment of the clutch with regard to the engine flywheel.

Yet very few ever think of properly testing the parts involved to see if the

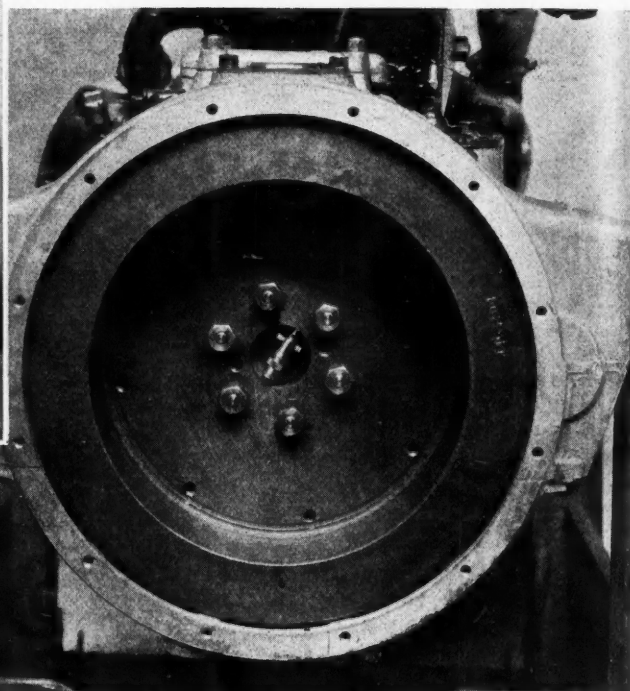
units are operating under adverse conditions. The finest clutch or transmission in the world will not stand up in service if it is not lined up properly. And they must be kept lined up, because the unit will be short lived if a shaft is allowed

\*Brown-Lipe Gear Co., Syracuse, N. Y.

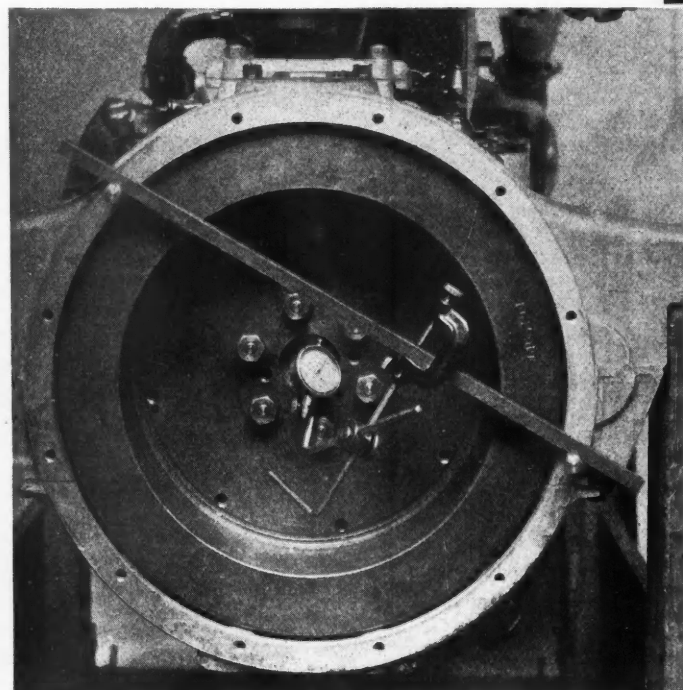
# Dial Indicator and Micrometers Necessary in



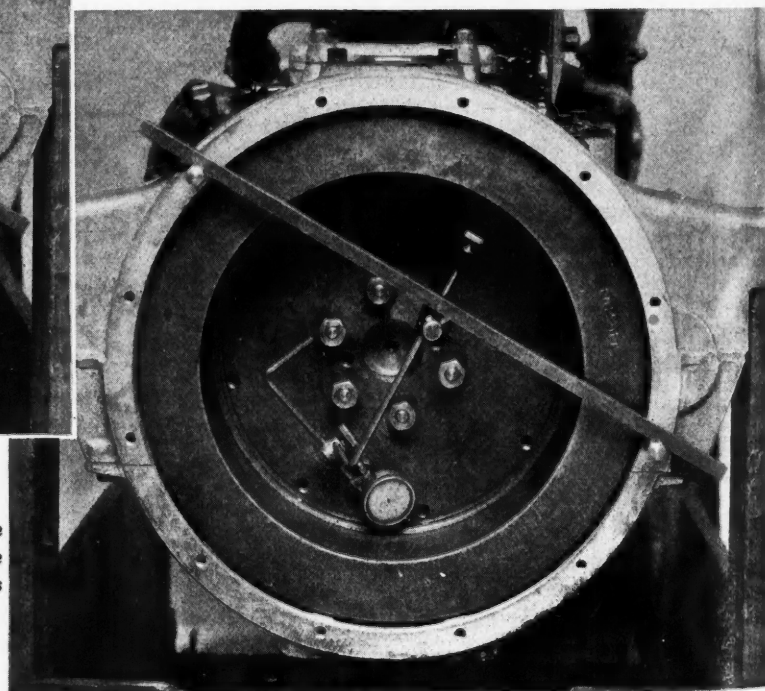
At the left is shown a set-up with a dial indicator with which a reading is taken of the flywheel face. It is this face to which the flange of the clutch drum is bolted and naturally if the face runs out of true the clutch will be affected



Right, in order to make sure that the flywheel recess for the clutch pilot bearing is of the proper size it must be measured with an inside micrometer



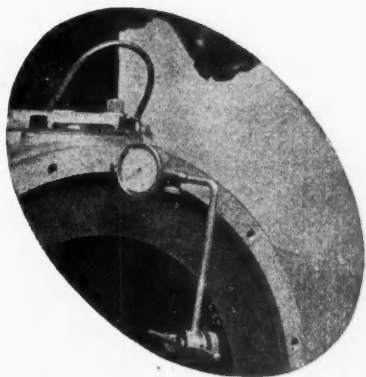
Below, taking an indicator reading of the clutch drum recess in the flywheel. If this recess is too large it allows the clutch drum to be bolted to the flywheel in an eccentric manner. A maximum plus tolerance of .003 in. over the standard dimension of 11.500 in. is permissible



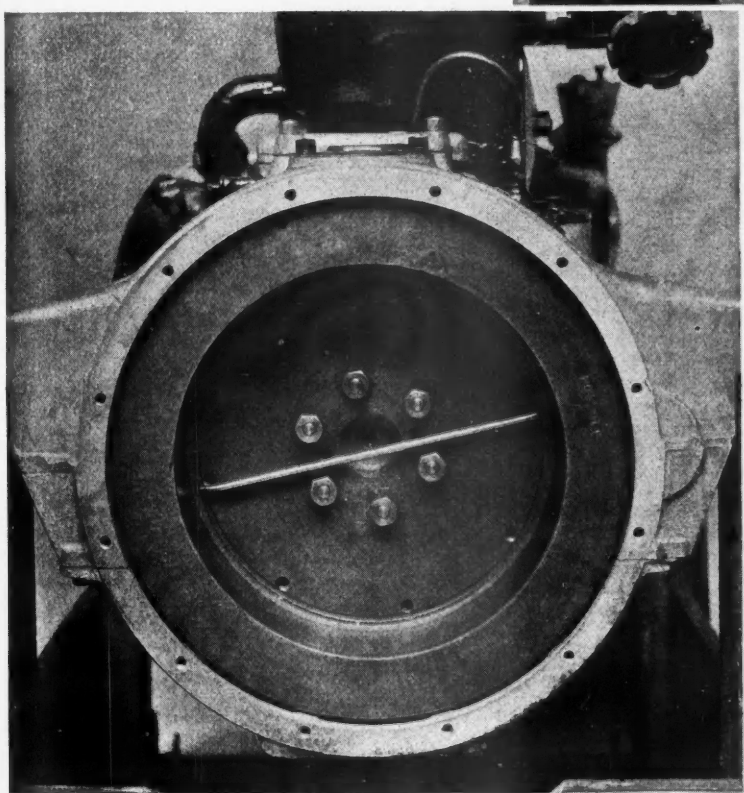
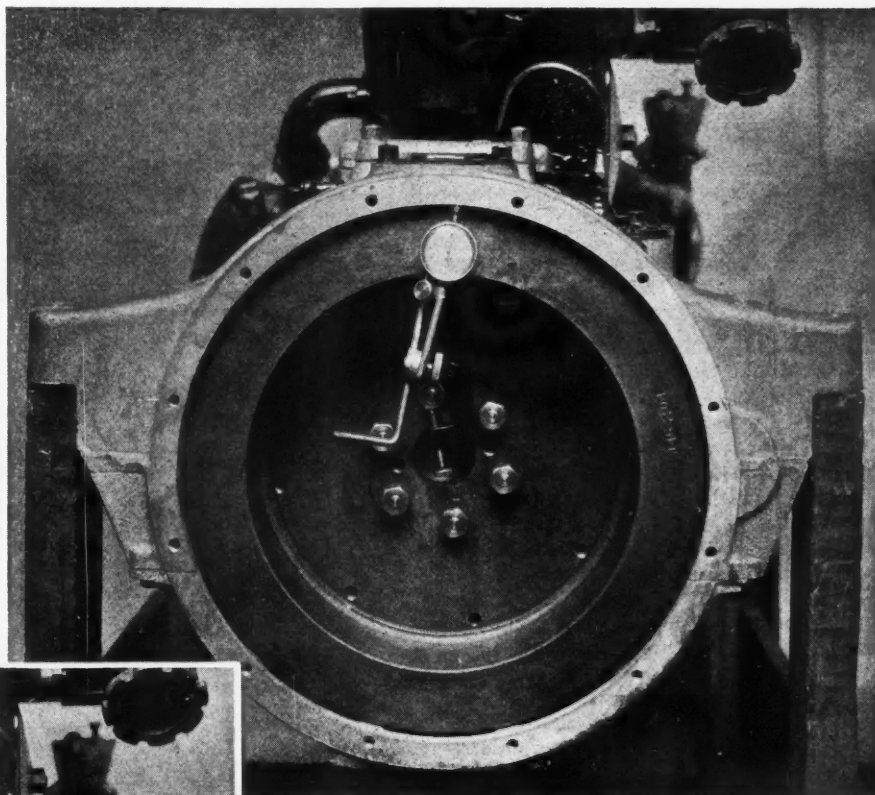
Above, the clutch pilot bearing recess in the flywheel must be concentric to .004 and the way to ascertain this is to use the dial indicator in the manner shown. In all these operations the flywheel is slowly revolved



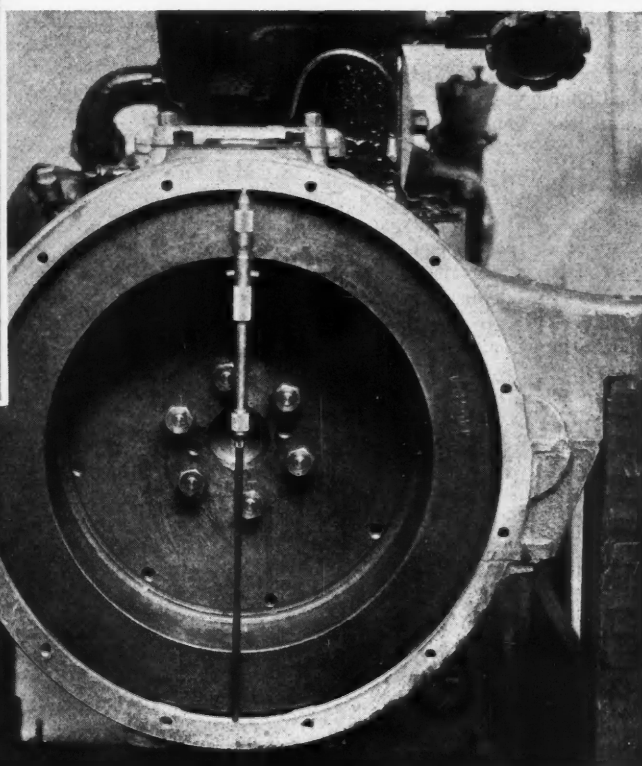
# Properly Servicing Clutches and Transmissions



The flywheel housing face must be parallel with the face of the flywheel, which is ascertained by clamping the dial indicator support to a nut on the flywheel and slowly revolving the latter. At the right is shown the manner of indicating the housing bore



Left, a gage used for determining the size of the clutch drum recess. A gage like this easily can be made in the shop and should be exactly 11.500 in. long



At the right is shown the manner of reading the size of the bore of the flywheel housing. For this an inside micrometer is used. This bore size is very important as the pilot on the bolting flange of the transmission bell fits into it. It should be concentric to .010 in.

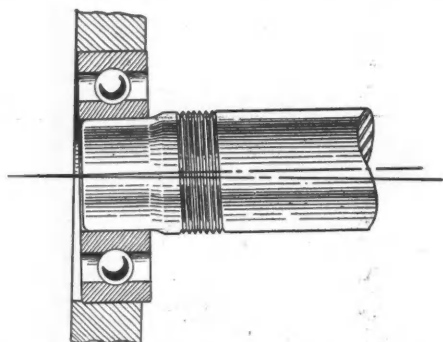


Fig. 3—A driving fit of the pilot bearing into the recess often results in the bore of the bearing not being at right angles with the face of the flywheel. This causes the clutch to run out of alignment. The bearing should be a light tap fit into the recess.

to wobble. This wobbling sooner or later wears out a bearing, which in turn makes the gears of the transmission mesh improperly and noise sets up.

Misalignment can generally be credited as being the one great cause of clutches not performing properly and perhaps has more to do with noisy operation of transmission gears after these units are assembled to the engine than any other factor.

Inasmuch as clutch and transmission work will come in for their share of attention in general automotive maintenance work, we suggest that every shop and service station be equipped with the necessary instruments for accurately diagnosing the real causes for clutch and transmission failure. Obviously there is little to be gained by a mechanic putting in a new clutch or transmission only to have these units fall again later on because the seat of the trouble was not found in the first place and remedied.

To that end we suggest that every shop get a good dial indicator, a straight steel bar about  $\frac{3}{8}$  by  $\frac{5}{8}$  in. and 24 in. long, inside micrometers and a steel bar to be used as a gage for ascertaining the dimension of the recess in the flywheel to which the flange of a clutch drum is bolted. This recess is an S. A. E. recommended dimension on 11.500 in. and should be held to a minus .000 in. and plus .003. This simply means that the diameter of this recess should be  $11\frac{1}{2}$  in. and that it is permissible to have the recess .003 in. larger, but .000 minus, means that under no circumstances must the recess be smaller than  $11\frac{1}{2}$  in.

Some of the causes of misalignment are the following:

1. Use of self-aligning bearing or bronze bearing for pilot bearing in flywheel, which bearing supports the pilot or front end of the clutch shaft.
2. Improper fitting of the pilot bearing in the flywheel.
3. Improper fitting of the pilot end of the clutch shaft or drive gear in the pilot bearing.
4. Improper fit of clutch drum flange in flywheel recess.
5. Flywheel running eccentric.
6. Bore of engine flywheel housing not concentric.

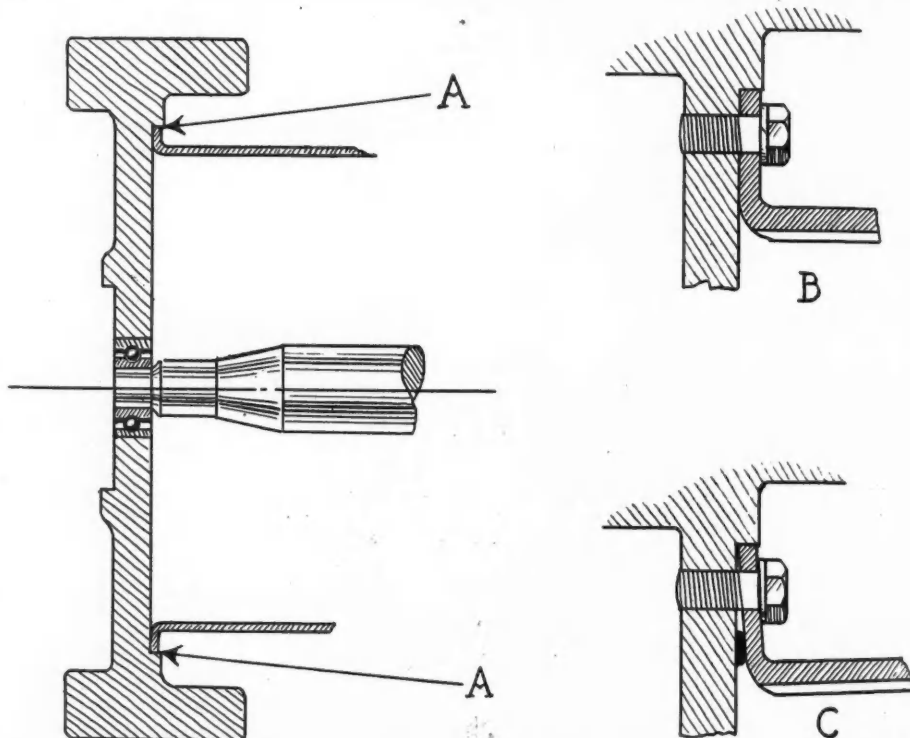


Fig. 4—The clutch bolting flange recess, shown at A, must be concentric to .003 and held to the S. A. E. dimension of 11.500 in. with a minus of .000 in. and plus of .003. At B is shown a proper fit of the flange into the flywheel recess, while at C there is misalignment caused by a steel chip or other foreign matter. This causes the drum to warp.

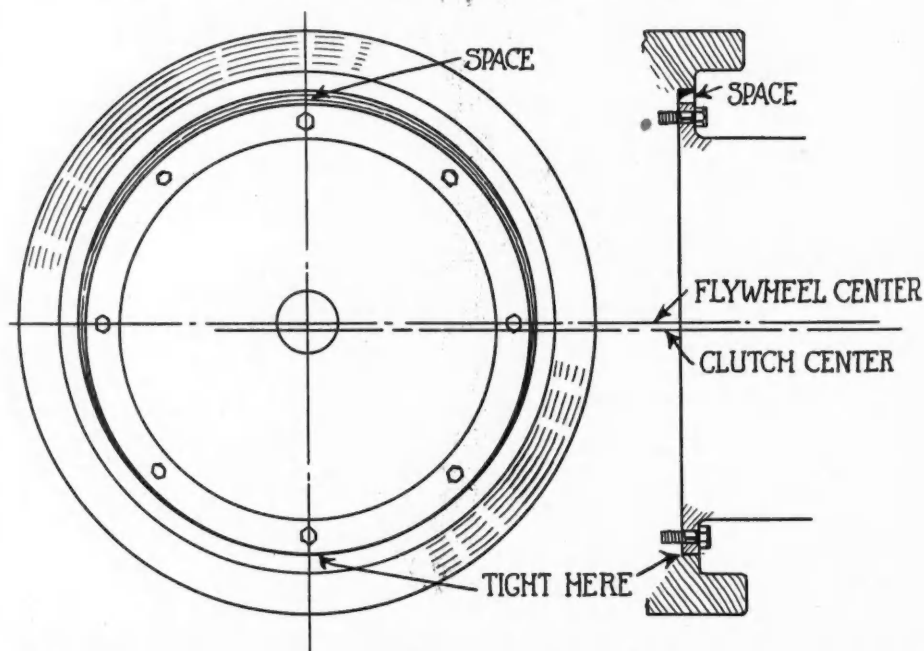


Fig. 5—Example of an oversize flywheel recess for bolting the flange of the clutch.—The cap screw holes being clearance holes only allow the drum to find its seat, usually in a misaligned position.

7. Face of engine flywheel housing not concentric.

8. Flywheel housing halves do not match up properly.

Although much of the following text matter has been written with Brown-Lipe clutches and gearsets in mind, the greater part of the text is applicable to all makes of clutches and gearsets. Regardless of the make or type of clutch or gearset, they must be lined up properly and, therefore, anything stated here will with certain modifications ap-

ply to all types and makes of clutches and gearsets.

The proper pilot bearing to use in flywheels for Brown-Lipe clutches, both multiple disc and single plate, should be a straight thrust ball bearing. It should be a light tap fit in its flywheel recess and a light tap fit on the pilot end of the drive gear. The recess into which this pilot bearing fits should be concentric within .004 in., Fig. 1. Never have this pilot bearing a running fit in its flywheel recess or a sloppy fit, because the



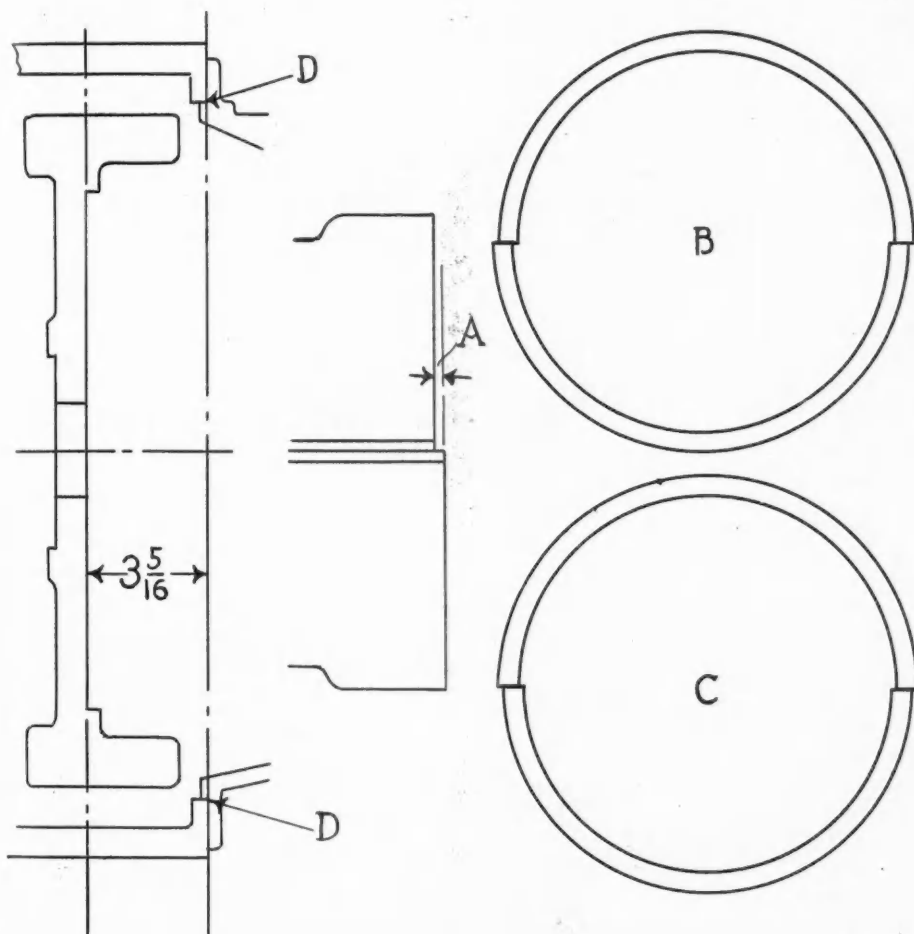


Fig. 6—Some things to watch out for when bolting the transmission bell to the flywheel housing. The lower half of the flywheel housing must line up and be exactly the same size as the upper. The bore of the housing, D, should be concentric to .005. The dimension  $3 \frac{5}{16}$  in. is very important and must be strictly maintained. The face of the flywheel should be concentric to .005 and that of the housing .010 in. C shows the upper and lower housings out of line, while at D the lower housing is too small. At A the upper housing is too short compared to the lower.

outer race of the bearing being hardened metal and its co-acting surface in the recess in the flywheel being a soft metal allows the complete bearing to turn in its recess and after a few thousand miles of operation, this recess becomes worn to such an extent that a pilot bearing can never be properly fitted unless the flywheel is removed, bored out and a bushing installed, as shown in Fig. 2.

Generally before this is discovered, the end of the drive gear which supports the clutch is wobbly and running out of alignment, due to this condition and generally causes a clutch failure. Never drive a pilot bearing into its recess in the flywheel. Generally when a driving fit is made of this bearing, it shears itself into its recess to some extent and in this event the bore is hardly ever found to be at right angles with the face of the flywheel, Fig. 3. Then, when the pilot end of the drive gear is placed into the bore of this bearing, it is held in this misaligned position and in turn causes a clutch to run out of alignment.

If a self-aligning bearing is used, it causes the clutch to wobble or run eccentric. If a bronze bearing is used, the hardened steel pilot end of the drive gear which fits into this bronze bearing soon

wears the bearing surface of such bronze bearing quite large after a few thousand miles, causing this bore to wear in an elongated hole and this in turn causes the clutch to wobble or run out of alignment.

The proper fitting of the driving clutch drum into the machined recess of the flywheel and the securing of this drum to the face of the flywheel is very important. The recess in the flywheel which is machined to receive the bolting flange of the clutch driving drum should be held concentric within .003 in. and should be held for size to the S. A. E. dimension of 11.500 in. minus .000 in. plus .003 in. Note Fig. 4.

The proper fit of the bolting flange of the clutch drum into its machined flywheel recess should be a light running fit. If the bolting flange of this drum is oversize or the recess into which it fits is undersize, or eccentric, so that a light running fit is not secured when bolting and securing the flange tightly to the face of the flywheel with the securing cap screws, it prevents the face of this bolting flange from taking up true to the face of the flywheel. This warps the driving drum, into which the clutch driving discs fit, out of round, thus pre-

venting the clutch from being properly engaged and released.

If steel chips or any foreign matter are left between the face of the drum bolting flange and the face of the flywheel, it has the same effect, that is, it does not allow the flange to take up true to the face of the flywheel and warps the drum out of round, Fig. 4.

If this machined recess in the flywheel is oversize or the bolting flange of the driving clutch drum is undersize, it allows this drum to be secured to the flywheel in a misaligned position, as the securing cap screw holes are clearance holes, generally  $\frac{1}{32}$  in. clearance, and this allows the drum to take up to the flywheel wherever the securing cap screws carry it to in finding a seat, Fig. 5.

In the case where either multiple disc clutches or single place clutches are used, the flywheel should run concentric within .005 in.

The distance of  $3 \frac{1}{8}$  in., which distance is a S. A. E. dimension, from the face of the flywheel to the face of the engine flywheel housing should be maintained within  $\frac{1}{64}$  in., while the width of the recess allowed in the flywheel of  $\frac{5}{8}$  in. should be maintained exactly and the overall dimension from the end of the crankshaft in the center of the pilot bearing hole in the flywheel to the face of the engine flywheel housing should be 4 in., which distance prevents the end of the drive gear from butting against the end of the crankshaft when the transmission and clutch are assembled to the engine.

The size of the bore of the engine flywheel housing should be concentric within .005 in. and such bore should never be undersize and should never exceed .010 in. oversize. The face of the engine flywheel housing to which the machined face of the transmission bell is secured should be concentric with the face of the flywheel and should never exceed being .010 in. eccentric.

It is absolutely necessary that the pan of any engine, if such pan contains half of the flywheel housing, be properly aligned, machined and held to size with the crankcase or upper half of the flywheel housing, as such pan forms a part of the engine flywheel housing.

There are five sizes of flywheel engine housing in which are S. A. E. standard. The bores of such housings into which the  $\frac{1}{8}$  in. pilot machined upon the bell of the transmission fits to secure the alignment of the transmission and clutch to the engine are as follows and are referred to as S. A. E. bell housings Nos. 1, 2, 3, 4, or 5, as the case may be.

Size No. 1.....	20% in.
Size No. 2.....	17% in.
Size No. 3.....	16% in.
Size No. 4.....	14% in.
Size No. 5.....	12% in.

The No. 3 housing 16% in. is the most generally used, particularly as regards passenger car construction, while No. 1 and No. 2 are used extensively in trucks.

## Importance of Correct Adjustments

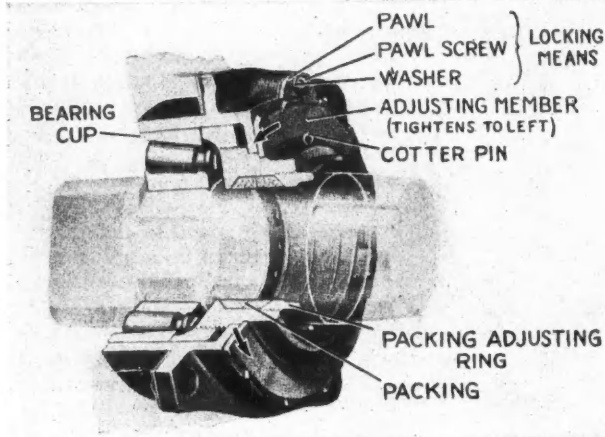


Fig. 8

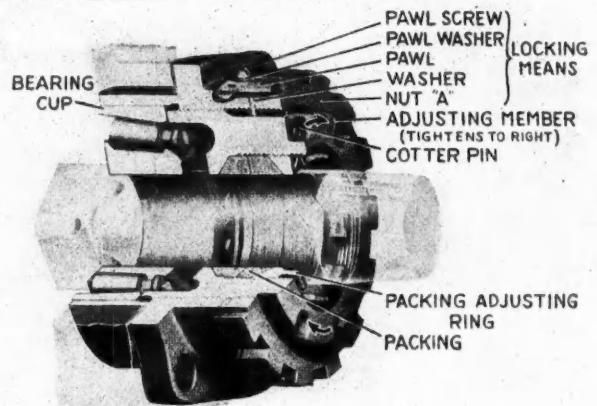


Fig. 9

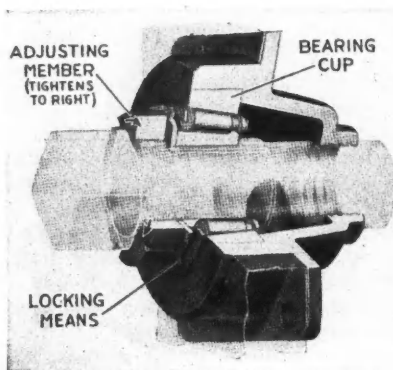


Fig. 10

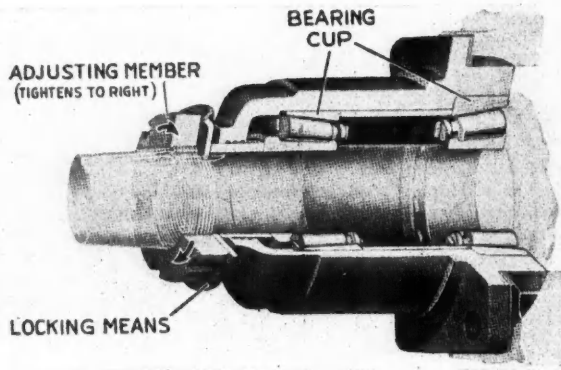


Fig. 11

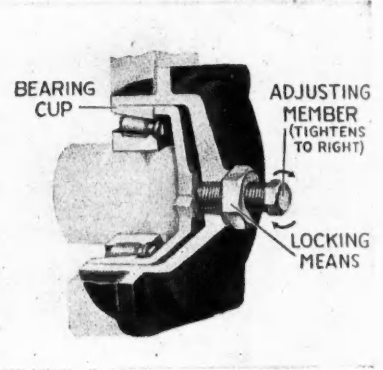


Fig. 12

It is important that taper roller bearings used in transmissions be maintained in correct adjustment. If the bearings are used extensively while too loose or too tight, they are almost certain to be injured or destroyed; whereas, when properly tightened as occasion demands, these bearings are virtually as good as new with each adjustment.

A correct adjustment of the bearings is one that holds them tight enough to prevent any perceptible endwise movement of the shafts, when the gears are in neutral position, yet permits the shafts to be turned easily by hand.

The first inspection of taper roller bearings in a transmission should be made when the car or truck has run approximately from 800 to 1500 miles, and thereafter inspections should follow at each 5000 miles of travel. Adjustments should be made, if necessary, with each inspection.

The illustrations on the opposite page show five forms of taper roller bearing adjustments used in Brown-Lipe transmissions. These are generally similar, each including an adjusting member and locking means. No adjustments for front main shaft bearings in unit power transmissions or for any front counter shaft bearings are illustrated, as such front bearings are cared for automatically in adjusting the rear bearings of these shafts.

In Fig. 8 the adjusting member turns to the left (counter-clockwise), to tighten the bearings; but in the other figures, the adjusting members turn to the right (clockwise).

The operation of adjusting is the same in all instances, viz., remove the cover, shift gears into neutral position, loosen or remove the locking means, turn the adjusting member and then restore the locking means.

To adjust bearings, proceed as follows:

### MAIN SHAFT—

- (a) Disconnect the universal joint or joints (one with a unit power and two with a main frame transmission).
- (b) Push and pull endwise on the shaft, and if looseness can be detected, tighten the bearings. Best results are obtained by alternately turning the adjusting member a notch and testing the shaft for end play.
- (c) In main frame transmission, adjust the front bearings before tightening the one at the rear.
- (d) In unit power transmissions, tighten the rear bear-

ing only. This operation also adjusts the front bearing.

### COUNTER SHAFT—

Pry with a pinch bar or screw driver against a fixed, counter shaft gear to move it endwise, and if there is any perceptible end-play tighten the rear bearings.

An adjustment should never be made so tight that the shaft cannot be rotated easily by hand when the gears are in neutral position, but if such tightness does occur, loosen or remove the locking means and proceed as follows:

### MAIN SHAFT BEARINGS IN MAIN FRAME TRANSMISSIONS—

Turn the adjusting members backward at both the front and rear of the transmission and tap lightly, with a lead hammer, on each end of the shaft, until it can be rotated easily; then adjust the bearings.

### MAIN SHAFT BEARINGS IN UNIT POWER TRANSMISSIONS—

Turn the adjusting member backward, insert two pinch bars or screw drivers in front of the drive gear and on opposite sides of the stem and pry toward the rear until the shaft rotates freely; then adjust bearings.

### COUNTER SHAFT BEARINGS—

Turn the adjusting member of the rear bearing backward, pry with a pinch bar or screw driver rearward against a fixed, counter shaft gear until the shaft turns easily, and then adjust the bearings.

In Fig. 8, the essential locking means is a pawl; in Fig. 9, it is a pawl, a tongued washer and a nut "A." These pawls and their securing screws and washers must be removed before the adjusting member can be turned. In Figs. 11 and 10 the locking means are washers, portions of which enter grooves in the adjusting members, and in Fig. 12, the locking means is a nut.

In Figs. 8, 9, 11 and 10, the adjusting members are threaded ring parts turning about the shaft, and in Fig. 12, the adjusting means is a screw that goes through the center of the bearing cap.

By reversing the locking pawl shown in Fig. 8, a one-half notch adjustment may be obtained.



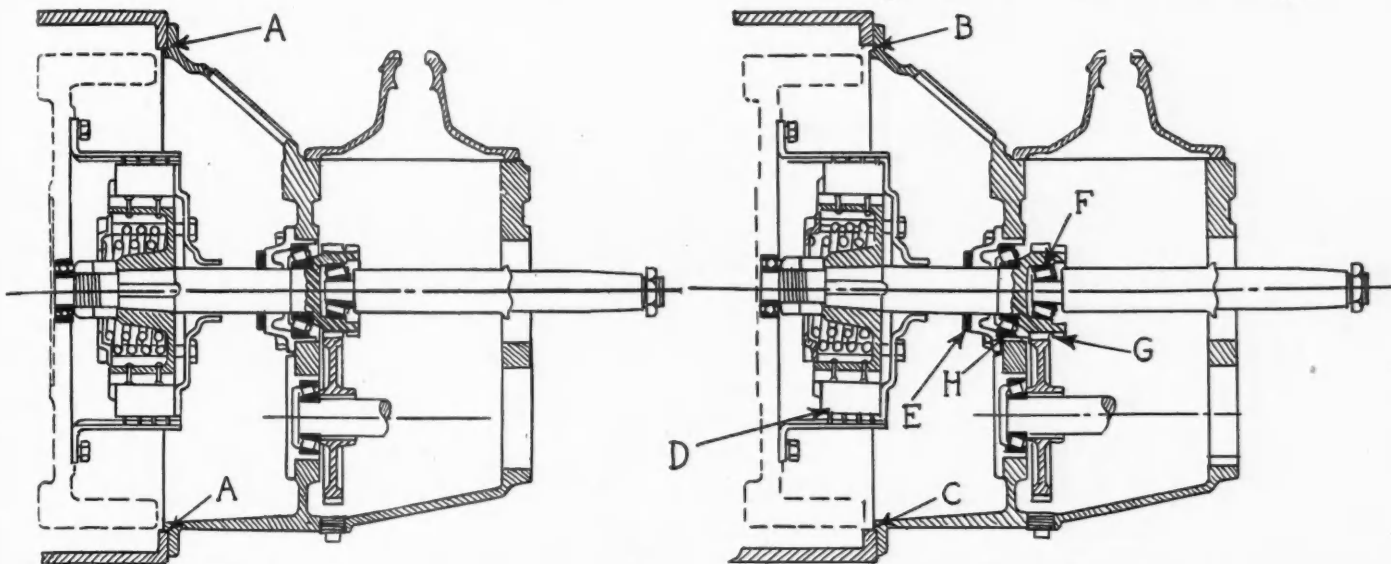


Fig. 7—Two cross sectional views of a clutch and transmission, showing in the one case a correct fitting of the transmission pilot into the engine flywheel housing. Note that there is no misalignment, the clutch and pilot bearing are in proper position and all parts are in proper relation

The other illustration shows misalignment, always sure to cause trouble in bearing failure, noise in the gears and improper functioning of the parts in general. Note that in the first illustration the pilot of the transmission bell fits perfectly into the flywheel housing, shown at A. B shows too much clearance between the transmission pilot and housing while at C it is a tight fit. D shows the wrong position of the clutch and drum and the eccentric motion causes wearing out of the bearing cap oil retainer E. This allows oil to leak from the transmission case. There is excessive strain upon the drive gear cup bearing F. Due to misalignment the drive gear G which supports the clutch and countershaft drive gear below it, being in constant mesh cannot mesh properly on their pitch lines and noise results. There also is undue strain on the bearing H.

The bore sizes as listed above should never be undersize and should never exceed .010 in. oversize, the reasons being as follows:

In the use of a multiple disc clutch the driving drum is secured to the flywheel and turns in one circle, while the clutch which it drives is secured to the drive gear of the transmission, which drive gear and clutch is supported to the engine by the transmission case at the rear end and by the pilot bearing in the center of the flywheel at the front. The securing cap screw holes in the bell of the transmission case are clearance holes, generally  $\frac{1}{8}$  in. oversize.

If the bore of the flywheel housing into which the pilot of the transmission case fits is undersize, this pilot cannot enter. This causes the bell of the transmission case, which transmission case supports the drive gear and clutch, to be drawn up to the flywheel housing out of alignment, thus warping the bell of the transmission case out of round. If this bore exceeds .010 in. oversize, it is extremely serious and does not allow the transmission to be piloted by its pilot, but rather allows the transmission case to be piloted by its supporting cap screws into whichever position, out of alignment, the transmission case finds a seat when drawn up to the engine.

If the face of the flywheel housing is eccentric exceeding .010 in., this also causes the transmission to throw the drive gear and clutch out of alignment when secured to such an engine.

Sometimes clutches will function several thousand miles when the transmission and clutch are assembled in a misaligned condition and the failure is generally apparent and causes the teeth in the driving drum, referring to a multiple-disc clutch, to become worn and grooved, while the teeth of the driving plates wear off and in the case of the single plate clutch, the splined hub of the driving disc wears quite rapidly and the splines of the drive gear which receives the hub, wear unevenly.

This wear when found can be attributed to a wobbly clutch or a clutch running eccentric, due to misalignment. In these cases of misalignment, it sometimes happens that the misuse that the cup bearing in the drive gear is subjected to, due to misalignment, fails before the clutch fails.

Due to this misalignment, generally excessive noise is developed in the transmission gears, as the drive gear, which has the clutch secured to it meshes with the drive gear of the countershaft and causes these gears to mesh improperly upon the pitch line.

When locating and analyzing a case of clutches sticking, grabbing and burning out and complaints of noise in transmissions, particularly when in neutral, proceed as follows:

Remove the transmission and clutch from the engine. Note what type pilot bearing is used in the flywheel. In the case of multiple disc clutches, see that the driving drum is a proper fit in its machined recess in the face of the flywheel. Secure a dial indicator to the flywheel bell housing and indicate the pilot bearing recess in the flywheel for eccentricity, then indicate the machined recess in the face of the flywheel which receives the bolting flange of the driving clutch drum.

The face of the flywheel is then indicated for eccentricity. The indicator is now removed from the flywheel housing and secured to the flywheel. First the bore of the engine flywheel housing is indicated to determine if it is concentric with the face of the flywheel. After this reading, the indicator is placed against the face of the flywheel housing to see if this face is concentric with the face of the flywheel. A pair of inside micrometers are then used to determine what the size is of the bore of the engine flywheel housing, which bore receives the pilot machined on the transmission bell.

#### CASING STOCK 11,355,428

NEW YORK, May 12.—It is estimated that there were 11,355,428 tire castings on the shelves of dealers throughout the United States on April 1, 1924. The basis for this estimate is the questionnaire asking for inventory data which was directed to a dealer list of 147,898 dealers in tires by the Rubber Association

of America. In view of present practices in the tire industry this is not regarded as an abnormally heavy dealers inventory for this time of year and it is generally felt that conditions are much better than they were a year ago in this respect.

A significant fact developed by the questionnaire, however, is the over-

whelmingly large percentage of so-called tire dealers carrying stocks of less than 50 casings each. This is interpreted by many as indicating that, while the total number of tires on the shelves of dealers is not abnormally large, it is so thinly spread over a great number of dealers as to make profitable trading a serious problem for many of them.

*Put! Put! Put! Put!—Put!*

## Locating Engine Misses

*There's the Old Fashioned Hunt and Peck System, but Systematic Methods Give Better Results*

By A. H. PACKER

FROM the little town of State Line the road winds west. Past a lake it goes, through the pine woods and ends in a lumber yard on the shores of another lake. Along this road we had wandered, in pursuit of the elusive Muskie and the gamey Bass, and as we pulled in at the lumber yard, we saw another car there ahead of us, the engine running and a garage man from a near-by town working to make it hit on all six.

"Somethin' wrong with the carbureter," volunteered the owner of the car, as we got out to stretch after a long ride. "Been stuck here several hours, man's been workin' on it quite a while but don't seem to get it adjusted right."

He certainly didn't.

First he turned a screw this way and raced the engine, then he turned it another way and raced the engine again, then he shorted the first plug and then the last, then tried the carbureter again. The process seemed interminable without definite beginning or end, and it seemed an open question, whether the action of the engine when he finished would be better or worse than before he came.

It was with difficulty that comment as to his haphazard methods was avoided. We agreed with the owner that it was certainly hard luck to get stuck that way, especially on a fishing trip, and with hardness of heart continued on our way.

Locating a miss is not always easy and it is for that reason that a systematic method of testing is essential. Not only do the guess-at-it methods usually accomplish little, but the bill run up for labor is out of all proportion to the value given the customer. Oftentimes he knows it, and either refuses to pay for work which has done the car no good, or if he does pay it is with a fairly certain conviction that he has been "gyped" and with the mental resolve to patronize that shop no more. In any case it is bad business and makes enemies rather than friends.

It is for this reason that in connection with this Summer Service Issue of *MOTOR AGE* we have published an insert which gives a systematic way of locating the cause of a missing cylinder.

### *What Makes 'Em Run*

Combustible gas, properly compressed with a miniature streak of lightning at the spark plug, and something is bound to happen. Of course a spark wrongly timed will cause trouble, but if the spark occurs at wrong time, then the gas is not properly compressed. A leaky valve causes trouble and again this would mean that we did not have proper compression. So it goes, all of the troubles that prevent the engine running or make it miss are troubles that affect the fuel or the spark.

Why did the garage man at the lake work with the carbureter? Probably because the owner said, "My carbureter needs adjusting." The owner usually takes a guess at what is wrong and if the repairman is fooled by a guess, then he may work in vain. On the other hand the owner might have guessed that the spark was weak when the carbureter might have been flooding. In this case the mechanic might also have been led astray and have filed interrupter points in a vain attempt to fix carbureter trouble.

### *The Right Way*

As spark and gas are needed; test to see that the spark is good. If O. K. go after the fuel system; if not, leave the carbureter alone until you KNOW the spark is O. K. Then



*He turned the adjusting screws, raced the engine and accomplished nothing*

it is time to go after other things, but there is no use until it is certain that the electrical parts are doing their bit.

The screwdriver test is a good one, when used to short out one plug at a time, but it does not go far enough. On an eight-cylinder car, for example, it is hard to tell the effect when one plug is shorted and the engine is still hitting on seven cylinders.

Seven screwdrivers would be the best tools to use, but who can hold seven screwdrivers at seven different plugs at the same time? That means that some other way must be used. On an eight-cylinder job, therefore, it is well to take the wires from one set of four cylinders off of the plugs and lay them so that they make contact with the engine.

The coil is strained when the engine is run with spark plug wires just hanging in the air. Laying the terminals on the engine enables the coil to send its spark current and saves straining it. That makes the eight-cylinder engine run on four cylinders. Now take off two more wires, say the front two, and also lay them on the engine. Now while the engine is running on these two, short out one plug at a time and see what happens. If the engine will run on one cylinder it is certain that that cylinder is not far wrong. In the same manner the other plug can be shorted and we have made a check on the other cylinder. Next the front two cylinders may be tested in similar manner and when the cylinders on one side of



ts

ed

ed

til

ut  
an  
ct  
on

no  
ne  
d.  
es  
m

ag  
ne  
es  
ur  
o,  
is  
ee  
is  
er  
on  
ed  
of